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Commercial Fisheries Abstracts

a monthly summary of important developments for the fishery industries

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In this issue~

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- Amylase in Fishes ——— P.1
- Spoilage of Cod ——— P.3
- Aluminum Gillnetters ——— P.5
- Irradiated Scallops ——— P.9
- Protein Denaturation ——— P.11

~ and 35 others

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Commercial Fisheries Abstracts

DIVISION OF INDUSTRIAL RESEARCH AND SERVICES
BUREAU OF COMMERCIAL FISHERIES

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Following is a brief outline of this filing system. The numbers apply to the first digit appearing on each card. For the meaning of subsequent digits, please see the above described leaflet.

0 General and theoretical
1 Fish by species
2 Fresh fish
3 Preserved fish
4 Oils
5 Vitamins
6 Fishery byproducts
7 Analytical Methods
8 Composition
9 Miscellaneous

Use of funds for printing this publication has been approved by the Director of the Bureau of the Budget November 23, 1956.

0.32 BIOCHEMISTRY

Anonymous
Food Investigation 1957, Report of the Food Investigation Board (Great Britain), pp. 25-27 (1958)

Fish-muscle proteins.--The texture, eating quality, and behavior of fish flesh during processing depend upon the nature and condition of its constituent proteins. Actomyosin can be extracted from freshly killed fish at an ionic strength well below that at which it is usually soluble. The actomyosin extracted at low ionic strength quickly aggregates and becomes insoluble. Ultracentrifuge pictures have shown that an unaggregated myosin can be extracted from fish muscle; the myosin, however, aggregated on being precipitated and redissolved. This behavior distinguishes unaggregated fish myosin from the corresponding mammalian myosin, which normally is prepared by precipitation. However, unaggregated cod myosin has been prepared by a dissociation of cod actomyosin with magnesium and pyrophosphate followed by ultracentrifugal separation.

The molecular weight, shape, and other properties of monodisperse cod actomyosin have been measured. Cod actin, purified ultracentrifugally, also is being studied. Unlike the corresponding mammalian proteins, the sarcoplasmic proteins of cod, which are soluble at low ionic strength, appear to contain large amounts of low-molecular-weight proteins. The electrophoretic examination of the proteins from the expressible fluid of cod muscle, which was a part of this study, has been completed.

Lipids.--The expected lipid breakdown after death is a steady production of free fatty acid from all types of lipids and the liberation of organic bases from phospholipids. In cod stored in ice, lipid degradation did not follow this course. After 12 to 14 days post mortem, during which period very little change occurred, free fatty acid was produced at a rapid rate along with a comparable destruction of phospholipid. This did not appear to involve a preferential loss of the bases or a change in the remaining phospholipid. If storage was prolonged, both indications of lipid breakdown diminished

(over)

ABSTRACTER: Martin Heerdt

0.38 MUSCLE AMYLASE OF FISHES

Andreev, A. K. (Higher Institute of National Economy, Varna, Bulgaria)
Biochemistry (U.S.S.R.) 23, 851-854 (November-December 1958)

The assumption that the breakdown of glycogen in the muscle of fish is carried out entirely by phosphorylation is without sufficient basis. Work by Drozdov and Zhuraskaia showed that a hydrolytic pathway also exists in the skeletal muscles of cattle and rabbits. The author here reports on his investigations to determine whether or not hydrolytic breakdown of glycogen occurs in fish muscles.

Experimental methods.--Forty grams of fish muscle was treated with twice its volume of water and 0.5 milliliters (ml.) of toluene as an antiseptic and was ground in a mortar for 30 minutes. The paste that resulted from this treatment was autolyzed at room temperature for 5 to 6 hours and then was centrifuged. Fifty ml. of the centrifugate was dialyzed for 24 hours against twice-distilled water at 5° to 8° C. to remove inorganic phosphates and the components of the adenylic acid system. The resulting dialyzate was added to 100 ml. of distilled water and was centrifuged to remove the globulins, which were precipitated during the dialysis. The clear dialyzed extract was used for the investigation.

The amylytic activity of the extract was determined by the hydrolysis of starch in samples of extract. The disappearance of the starch was determined by the disappearance of the blue color with iodine, and the appearance of reducing substances was determined by the method of Hagedorn and Jensen.

Samples with the following composition were used to establish the amylytic activity of fish muscle: 20 ml. of dialyzed aqueous extract, 3 ml. of 1-percent starch solution, and 0.1 gram NaCl

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ABSTRACTER: Kathryn L. Osterhaug

0.36 BIOCHEMISTRY

Anonymous
Food Investigation 1957 (Great Britain), pp. 27-29 (1958)

Extractives of fish muscle.--Extractives are responsible for most of the flavor of white fish muscle. Technologically, changes and reactions in muscle extractives are important in all classes of fish processing. In respect to its content of free amino compounds and sugars, cod flesh changes considerably during chill storage, during dehydration, and--depending on its condition before freezing --during thawing. Preliminary studies on the acid-soluble nucleotides and their derivatives were reported in 1956.

In addition to changes in flavor, this nucleotide study of fish caught under different conditions has special significance with regard to differences (1) in the onset of rigor, (2) in the resolution of rigor, and (3) in the keeping quality during storage. Sugar available for the Maillard reaction in dehydrated muscle and the postrigor pH, which determines the course of such reactions, also are determined by measuring nucleotide degradation after death. The mono-, di-, and triphosphates of adenosine, guanosine, cytidin, and uridine have been identified in fresh muscle together with di- and tri-phosphopyridine nucleotides, inosinic acid, uridine diphosphate sugar compounds, and a cyclic adenine nucleotide of undetermined constitution. The concentration of the major nucleotide constituents has been determined by ion-exchange resin separation and ultraviolet absorption measurement.

Trawled codling in the last stages of exhaustion had 0.2 μ moles per gram of adenosine triphosphate and 5.8 μ moles per gram of inosinic acid, whereas rested fish had 5.4 μ moles per gram of adenosine triphosphate and 1.3 μ moles per gram of inosinic acid. Differences in adenosine triphosphate resulted from deamination and dephosphorylation during the struggle. After death and during

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ABSTRACTER: Martin Heerdt

0.5 BACTERIOLOGY

Anonymous
Food Investigation 1957, Report of the Food Investigation Board (Great Britain), pp. 24-25 (1958)

Microbiology of salts and brines used in smoke-curing.--Further studies on the curing salts in commercial use have confirmed that the counts of ordinary nonhalophilic bacteria are in the range 10^2 to 10^3 per gram. The types of bacteria present on solar salts consist mainly of Bacillus and Micrococcus spp., whereas in rock salts, Micrococcus spp. predominate. Brines investigated in this study had been used in an Aberdeen smoke house to prepare haddock for smoke curing as "finnans." These brines were prepared each day from a stock tank holding saturated brine made from mined salt by diluting it to 75° salinometer in quantities sufficient to supply several concrete fish-brining tanks. Four-stone lots of fish were immersed for 7 to 10 minutes, removed by hand, and hung on tenters for smoke-curing. Each tank had a throughput of 10 to 100 stones of fish per day.

Optimum viable counts were obtained with 500-milliliter (ml.) samples of brine that were plated onto nutrient agar containing 0.5 percent NaCl and that were incubated at 68° F. These conditions were observed in all subsequent work.

Two experiments have now been completed in which samples were taken from the stock-brine tank and from the fish-brine tanks (1) just before fish had been immersed, (2) immediately after, and (3) at intervals of 4 to 8 hours after the first introduction of fish. A large increase in the bacterial population occurred as more and more fish were brined.

In another experiment, counts were made on the brine (1) before immersion of fish, (2) immediately after immersion of fish, (3) after removal of fish at the end of a 10-minute brining period,

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ABSTRACTER: Martin Heerdt

FISH PROTEINS AND LIPIDS

MUSCLE CELL SIZE AND EXTRACTIVES

AMYLASE IN FISHES

BACTERIOLOGY OF FISH AND BRINES

0.36

storage in ice, the levels of adenine nucleotides fell rapidly for 2 days and then leveled off, although enzyme systems capable of degrading them still remained in the muscle. The amounts of adenosine mono-, di-, and triphosphate in the residual 0.3 to 0.4 μ mole of adenine nucleotide were found to depend on whether the muscle was from rested fish or from trawled fish. Diphosphate was higher and mono- and triphosphates were proportionately lower in rested fish than in trawled fish. Inosinic acid levels fell less rapidly. Present information indicates that the rapid rise in the ammonia content of muscle immediately after death is almost entirely from the deamination of adenine nucleotides. Observations made at Torry Station indicate a stoichiometric relation between ammonia formation and the conversion of adenine- to hypoxanthinenucleotides.

Fish muscle cell size.--A method has been devised for separating cod-muscle cells from each other without damaging them and for measuring them with a micrometer eyepiece. In cod 10 to 38 inches long, a linear relationship existed between the body length and the length and the width of the cells. Cells from myotome 12, counting from the anterior end of the fillet, were used for these measurements. The widest and longest cells were found at or near myotome 12, the point from which cell sizes tapered off anteriorly and posteriorly. Cells from myotome 12 in fish of the same size did not show seasonal variation. When cod fillets were examined, the concentration of DNA was, as was expected, minimal in myotome 12 and maximal at the anterior and posterior ends of a fillet. The relationship between body length and DNA concentration in myotome 12, however, was not linear, as might have been expected, and the amount of DNA per cell appeared to increase with an increase in the size of the fish.

Metabolic products of marine bacteria.--A purple metabolic pigment from a marine chromobacterium identified as B.C.I. appears to be identical with the terrestrial bacterial pigment violacein. In collaboration with members of the Department of Organic Chemistry at Liverpool University, violacein has been shown to be an indolyl oxindolylidene hydroxypyrrole.

0.5 (Cross Reference: 3.4)

and (4) after the immersion of a second lot of fish. Results showed an immediate tenfold increase in the count 2 minutes after the first immersion. This was followed by a slight decrease during immersion and a definite and more marked decrease after the removal of the fish. Immersion of the next lot of fish resulted once more in a large increase in the count. Micro-organisms brought in by the fish themselves contributed most to the increase in bacterial numbers.

A progressive increase in the numbers of Micrococcus spp. occurred during a day's brining activity, but this increase is dwarfed by an enormous increase in both the Corynebacteria and the Gram-negative rods. Pseudomonas spp. were almost completely absent. A major factor in the preservative efficacy of the smoke-curing procedure is the suppression of fish-spoiling Pseudomonas spp. first by brining and then by smoking.

Marine bacteriophages.--Only one bacteriophage was successfully isolated from a marine source. This bacteriophage was active against a yellow pigmented organism provisionally classified as Flavobacterium or Cytophage, but it did not show any marine properties on preliminary examination.

Luminous bacteria.--Studies on the distribution, classification, and identification of the luminous bacteria that form a large part of the intestinal flora of fish are being continued. Studies with luminous bacteria from fish caught around the British Isles are now almost complete. The results given last year on the frequency of occurrence of luminous bacteria in the intestines of such fish, their numerical importance, and the presence of two main types have been confirmed. Studies on the properties of the group characterized by yellow pigmentation, marked vibrio-like morphology, and starch fermentation are nearing completion.

Type-culture collection of marine bacteria.--An apparatus has been designed in which cultures are being prepared for long-term storage by the Greaves centrifugal vacuum freeze-drying method, the Sordelli method, and the Annear methods. At the same time, better methods are being sought for maintaining certain Flavobacterium spp. and Vibrios. Cultures stored in 15-percent glycerol broth at -20°C., as suggested by Howard, have remained viable for at least 6 months. The culture collection is becoming increasingly well known, and during the current year, over 150 cultures from various countries have been deposited. Over 80 cultures have been sent on request to different places abroad.

0.32 (Cross Reference: 0.36)

in rate of change after 30 days post mortem. Further change in the lipids stopped after 35 days in ice. When the study was terminated at the end of 49 days, about 30 percent of the original phospholipid still remained; and throughout the entire 49 days in ice, no detectable breakdown of lipids occurred other than that of the phospholipids.

Fat oxidation.--Some of the hydroxy components obtained by the reduction of crude mixtures of the peroxides of autoxidized methyl linoleate are readily dehydrated to a conjugated triene. The acid obtained by hydrolysis and then oxidized with permanganate appears to be a mixture of 10,12-octadecatrienoic acids, which are similar and inseparable acids. This indicates that the original crude mixture of peroxides contained esters of 9-hydroperoxide, 10,12-octadecadienoic and 13-hydroperoxide, 9,11-octadecadienoic acids. A method is being developed for the routine preparation of pure methyl linoleate hydroperoxide, which will be used for studying the action of all types of prooxidants and antioxidants.

Studies on antioxidants.--Polyphenolic antioxidants are limited in their usefulness as food additives by their relatively low solubility in fats and unsatisfactory fat-water partition coefficients. A series of alkyl derivatives of hydroxyflavone antioxidants has been prepared. Three members of this series--6-n-hexyl-3:7:2':5'-tetrahydroxyflavone, 6-stearyl-7:8:3:2':5'-pentahydroxyflavone, and 7-cetylozy-3:2':5'-trihydroxyflavone--possess satisfactory solubility and partition characteristics.

Work has been continued on the design and synthesis of antioxidants derived from simple, readily available hydroxy γ pyrones. Preliminary testing of these compounds indicates that the most active ones have about 15 times the activity of propyl gallate. These antioxidants are easily prepared, and they can be tailored readily to possess desirable physical characteristics. Since both these compounds and the polyhydroxyflavones are nonvolatile and very stable, they may have useful application in baked foodstuffs and in fish meal.

0.38

as an activator. Replicate determinations were run, but in one case without NaCl and in another using a boiled sample. The samples were incubated for 2 to 3 hours at 37°C., and during this time, changes in color with iodine and content of reducing substances were determined periodically.

Results.--The results of the experiments demonstrated the presence of considerable amylytic activity in the aqueous extracts of fish muscle. The hydrolytic splitting of glycogen in fish muscle does not exclude, however, the possibility of the existence also of a phosphorylative pathway.

The amylase of fish muscle was found to be most active at NaCl concentrations around 0.44 to 0.50 percent. Optimum action of fish amylase occurs at 37° to 42°C. and pH 6.9 to 7.2. From the nature of its action, fish muscle amylase belongs to the α type.

2.01 RECENT STUDIES OF DECOMPOSITION IN FROZEN RAW COD

Beacham, L. M. (U. S. Food and Drug Administration, Washington, D. C.)
Lecture delivered at the Annual Meeting of the Inspection and Consumer Service, Department of Fisheries, Ottawa, Ontario, Canada, November 3-7, 1958

When raw foods are processed into finished products, the organoleptic characteristics that connote decomposition are lost or are disguised to such an extent that the unfit character of the original raw material can no longer be readily detected. It is then that chemical indices can be used to reveal and establish the presence of decomposed material in samples of processed food. A considerable number of those chemical compounds that result from the breakdown of proteins, fats, and other food constituents during decomposition have been investigated by researchers at the Food and Drug Administration during the past 25 years.

When the current studies were undertaken on frozen raw cod, at least nine chemical determinations were available that showed promise of being useful indices of decomposition. These determinations were (1) volatile acids, (2) formic acid, (3) acetic acid, (4) succinic acid, (5) alcohol, (6) histamine, (7) volatile base, (8) volatile amines, and (9) trimethylamine.

Preparation of samples.--The packs of frozen cod were prepared as follows:

1. Commercial icing procedures were simulated on gutted cod that had been obtained directly from the boats and had been out of the water for less than 24 hours. Ice was placed on the bottom of a fish box, and then the box was filled with alternate layers of fish and ice, with a final topping of ice.

2. A replicate of pack (1) was prepared from another lot of fish.

3. This pack was the same as (1) but not iced.

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 ABSTRACTER: Kathryn L. Osterhaug

2.02 MUSCLE PHYSIOLOGY AND BIOCHEMISTRY

Anonymous
Food Investigation 1957, Report of the Food Investigation Board (Great Britain), pp. 36-37 (1958)

Rigor mortis.--Meat passing from the fresh state into rigor mortis has been studied with particular reference to the isolation of the muscle-relaxing factor of Marsh, which operates in the presence of adenosine triphosphate (ATP). These studies indicate that (1) the factor is found in the fraction of the soluble muscle proteins precipitated by half-saturated ammonium sulphate; (2) the enzyme myokinase, which was thought to be identical with the factor, is not an essential part of it except in the case of bundles of fibers when transport of ATP to the center of the bundle is a limiting condition; and (3) the factor, after further purification, is found to be associated with the smaller granules of the sarcoplasm, which are sedimented at about 80,000 grams.

The factor described above (1) has properties similar to those described originally by Marsh, (2) is particularly labile to heat or acid, and (3) is specifically activated by magnesium ions and inhibited by calcium ions. In these respects, it can clearly be differentiated from other inhibitory effects such as the optimal effect of ATP or of pyrophosphate. To a certain extent, the properties of the factor can be simulated by the chelating agent, ethylene-diamine tetra-acetic acid (EDTA), which inhibits myofibrillar ATP-ase activity and brings about relaxation of fibers under load. The action of EDTA, like that of the factor, is neither stopped by an excess of magnesium ions nor increased when inosine triphosphate replaces ATP as the contracting agent.

A detailed investigation of the ATP-ase activity of myofibrils indicated that the activation energy of the process is very much greater in the presence of magnesium ions than it is in the presence of calcium ions. Raising the temperature from 32° to 95° F. thus increases the rate of splitting about

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 ABSTRACTER: Martin Heerdt

2.113 CAVITATION DAMAGE--A REVIEW OF PRESENT KNOWLEDGE

Godfrey, D. J. (Admiralty Materials Laboratory, Holton Heath, Poole, Dorset, England)
Chemistry and Industry No. 23, 686-691 (June 6, 1959)

Cavitation damage is a type of attack characterized by pitting that may occur in hydraulic systems having extreme conditions of turbulence, liquid flow, or vibration. It is a frequent cause of trouble in ships' underwater fittings--especially propellors; in pumps and pipework; and also in diesel-engine cooling systems where severe vibration occurs.

Early investigators of the cause of erosion suffered by ships' propellors suggested that cavities within the liquid occurred in regions of low pressure that arose from diverging or turbulent flow and that these collapsed rapidly and destructively on solid surfaces in their vicinity. Numerous authors have calculated the magnitude of the forces involved, predicting pressures of hundreds and thousands of atmospheres. It has been found that nonmetallic materials such as bakelite, rubber, glass, quartz, and agate are attacked by cavitation, suggesting electrolytic effects to be of little significance. It has been suggested that an important factor in cavitation damage is the effect of liquid moving on a metal surface, relative speed and angle of incidence being of prime importance. Some authors distinguish cavitation damage from this impingement damage by the fact that in the former, strong hydrodynamic cavity collapse forces disrupt the metal surface, perhaps weakened by corrosion, whereas in the latter a cathodic surface corrosion product film is removed by weaker hydrodynamic turbulence forces. Both mechanisms may in reality occur together. Cathodic protection has been claimed by several workers in laboratory tests to be effective in diminishing cavitation erosion.

Researchers have found that the presence of air in small amounts is effective in substantially reducing cavitation. Air-bubble size also appears to be significant, large bubbles stimulating attack and small ones cushioning damage.

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 ABSTRACTER: Frederick Wathne

2.115 PLASTICS FOR MARINE APPLICATION

Anonymous
British Plastics 31, No. 5, p. 192 (May 1958)
World Fisheries Abstracts 10, 5-6 (January-February 1959)

The following papers were read at the meeting of the Institute of Naval Architects and the Institute of Marine Engineers held at Portsmouth and Southampton, England, from 23-24 April 1958.

Plastic materials (13 pp.), by V. E. Yarsley. This paper discusses the types of materials that are termed "plastics" and their broad subdivision; the chemical families of industrial plastics; raw material for plastics; the manipulation of plastics; the physical properties of plastics; applications of plastics; and the future of plastics.

Plastics in ships' hulls and accommodation spaces (9 pp.), by J. West. This paper discusses: cabin fittings; laminated plastics; thermo-plastic wall coverings; soft furnishings; plastic deck coverings; reinforced plastics; plastic paints and coatings; pipes and rods; and nylon and terylene.

Plastic boatbuilding (6 pp.), by G. Wood. This paper discusses type of craft; manufacturing methods; economics; design; and advantages.

Plastics in marine engineering - thermo-setting laminates (7 pp.), by J. M. Fleming. Problems of insulation of marine equipment are similar to those of other electrical and electronics apparatus. In this paper consideration is given to the temperature classification of insulating materials and the various plastics are allocated to the appropriate groups.

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SPOILAGE OF COD

MUSCLE PHYSIOLOGY

CAVITATION DAMAGE

PLASTICS FOR HULLS

2.02 (Cross Reference: 0.36)

250 times in the presence of magnesium ions but only about 50 times in the presence of calcium ions.

Post-mortem formation of glucose in muscle.--The main cause of the staling of dehydrated meat when oxygen is excluded is glucose formed post mortem in muscle by the action of α-amylase, the glycogen-splitting enzyme, and of maltase. The optimum pH of α-amylase in rabbit muscle in isotonic KCl has been found to range between pH 6.8 and 7.2, a value range that agrees with a pH value of 6.9 for animal amylases. The optimum pH of the maltase present in the same system, as judged by the rate of formation of free glucose, also is pH 6.9 to 7.2, which is higher than is the accepted pH value of 6.6 for animal maltases. The activities of the α-amylase and maltase present in suspensions of rabbit muscle in isotonic KCl are not altered by dialysis--nor are these enzymes bound to the myofibrils or the muscle granules.

Carnosine and anserine.--These substances, which are dipeptides of β-alanine with histidine and methylhistidine, respectively, occur in meat in concentrations that in total may exceed 1 percent. Little is known of the metabolic function of these compounds. They have no activating effect upon the glycolytic cycle of muscle if contamination of the reagents by heavy metals is carefully avoided. Their reported activating effect on glycolysis appears solely to be due to their removal of copper or of other heavy metal contaminants from the reacting system. Carnosine and anserine phosphates also might occur in muscle and act as sources of energy-rich phosphate in addition to creatine phosphate. Careful chromatographic analysis, however, has failed to reveal the presence of any labile phosphate in this form. These and other findings suggest that the most probable role of carnosine and anserine in muscle is to act as buffers in the physiological range of pH. This hypothesis is strengthened by the occurrence of large quantities of anserine in the muscle of blue and fin whales in which a high buffering capacity would be required and by an inverse relationship between the oxidative capacity of whale muscle and their dipeptide content.

2.115

Decorative laminated plastics in ships (7 pp.), by H. S. Newcomb. Decorative laminated plastics have been used in the shipbuilding industry for almost 25 years. During that period considerable progress has been evident in the improved properties and extent of applications. The popularity of these materials is due in the main to their moderate initial cost combined with their low maintenance charges. The durability of the surfaces is dependent on quality, the suitability of the form of material specified, and the method of fabrication and installation. In this paper, a description is given of the basic method of manufacture, together with details of the forms of products available. Recommendations regarding fabricating and installing are also quoted.

2.01

4. A replicate of (3) was prepared from another lot of fish.

5. Ungutted cod in prime condition were allowed to stand overnight uniced, and they then were gutted and iced down as was (1) above.

These packs were prepared in order to observe the progress of decomposition during storage under various conditions. The temperature of the fish was taken each morning, and fillets were cut and examined organoleptically and then were frozen for later chemical examination.

6. In addition to the five packs already described, several samples were prepared that consisted of fillets that already had suffered decomposition on the boat and had been rejected at the time of unloading. These fillets were judged and classified organoleptically and then were frozen.

7. As a final sample, a pack of fillets was prepared from "bilgy" fish. These fish were obtained by fastening good-quality cod between two slimy and wet pen boards from the bottom of the hold of a trawler that had just finished unloading and storing them for 4 days at 30° to 33° F.

Five classifications were used to describe the organoleptic condition of the fish: class 0 = fresh, class 1 = stale, class 2 = very stale, class 3 = advanced decomposition, and class 4 = putrid.

The frozen samples of fillets were analyzed for the nine indices already listed. Class 0 contained only small amounts of volatile acids, succinic acid, alcohol, volatile bases, volatile amines, and trimethylamine. No significant increase occurred in any of these constituents as long as the fish remained in class 0 organoleptically. Formic acid did not appear in any of the samples until class 2 decomposition was reached. No histamine was found, regardless of the degree of decomposition. The other indices increased progressively as the degree of decomposition advanced.

A study of all the data leads to the conclusion that formic acid perhaps is the best single index, since it is found only in decomposed fish and always is found there. Volatile acids, volatile bases, volatile amines, and trimethylamine also are of value because they frequently occur in quite large concentrations after decomposition has developed. Succinic acid and alcohol can also be useful, but they often do not form to any extent even in badly spoiled cod.

2.113

Environmental factors affecting cavitation erosion resistance including (1) the cavitation number, (2) temperature, (3) pressure, and (4) fluid composition are discussed.

Properties of materials affecting cavitation erosion including (1) hardness, (2) grain size, (3) tensile strength, (4) fatigue, (5) inclusions, and (6) resilience are discussed briefly.

Suggested countermeasures to minimize cavitation erosion were:

1. The pressure in the system may be raised.

2. Chemical inhibitors--for example, sodium chromate or soluble oil--may be added to a closed system.

3. Materials of high cavitation damage resistance may be used.

4. A resilient organic coating may be used, such as neoprene, nylon, or rubber.

5. Cathodic protection may be used.

6. Air may be injected into the system, or cathodic protection may be used at high current density to generate hydrogen.

2.115 FAO FISHING BOAT CONGRESS AIRS NEED FOR GREATER BOAT SAFETY AND EFFICIENCY

Anonymous
National Fisherman 40, 11, 34 (June 1959)

The chief concern of the World Fishing Boat Congress that met in Rome, Italy, from April 5 to 10, 1959, was the design and construction of fish boats that are efficient, safe, and seakindly.

The fish boat constitutes the major part of fisheries investment in highly developed countries. A recent investigation has shown the figure to be 67 percent of the total investment. As mechanization progresses, the investment tends to absorb a higher proportion of the total. This fact illustrates the dominant position held by the boat in fishing industry economics. Fish-boat architects are considered not only as draftsmen, but as developers of boats that give maximum yield under various circumstances.

Subjects covered by the Congress included (1) construction, (2) sea behavior, (3) productivity, and (4) tactics.

Construction.--The subject of construction covered scantlings, new materials, fish holds, installation of machinery, and construction costs. Dwight Simpson, a marine architect from Boston who was reporting on an investigation of fishing vessels from 50 to 150 feet, said that a wooden boat is no better than its fastenings. Round fastenings give better holding power than do square fastenings that are 33 percent heavier. On a weight basis, small fastenings have greater holding power than do large ones and are less apt to split the wood.

Plastic is being used increasingly in the construction of smaller boats. The low initial cost and low maintenance cost are the chief advantages of plastic.

(over)

ABSTRACTER: Kathryn L. Osterhaug

2.115 SHEATHING OF BOAT HULLS

Anonymous
British Plastics 31, No. 5, p. 196 (May 1958)
World Fisheries Abstracts 10, 5-6 (January-February 1959)

Sheathing with polyester resins reinforced with a glass or synthetic fabric protects woodwork from attack by marine borers, increases the resistance of the hull to damage by abrasion and impact, and reduces maintenance of the boat. In a new technique, known as the Cascover process, developed by a Southampton, England, firm, sheathing of the hull is carried out using nylon fabric which is bonded to the hull with a resorcinol resin. The sheathing is a specially treated and woven type of nylon fabric which is tough, has excellent abrasion resistance, and is impervious to the effect of salt water and weather. The sheathing is finished with a vinyl surface coating material which allows thorough impregnation of the nylon fabric, thus giving a completely waterproof skin.

The sheathing is not antifouling, but it does not accept weeds as readily as conventional finishes, and weeds can be easily cleaned off. Tests are being carried out by the Tropical Testing Establishment, of the British Ministry of Supply on test panels of African mahogany, which is very susceptible to teredo attack. Preliminary results have shown that sheathing with nylon fabric, with or without vinyl resin finish has protected the panels against teredo attack for 22 weeks, whereas unprotected panels were completely destroyed.

For boats up to 25 ft. (7.6 m.) long o.a., using 4 oz. (113 g.) nylon cloth, the cost is 5s. 6d. to 6s. 9d./sq. ft. for boats over 25 ft. or for heavy-duty work on decks, using 12½ oz. (354 g.) nylon cloth, the cost is 8s. 9d. to 10s./sq. ft.

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2.117 STERN VS. SIDE TRAWLERS, FRESH VS. FREEZER CRAFT, PLASTIC FISH BOAT HULLS, ATOM POWER POSSIBILITY

Alverson, D. L. (Bureau of Commercial Fisheries, Seattle 2, Washington)
Pacific Fisherman 57, 43-45 (May 1959)

Some of the major topics of discussion at the second World Fishing Boat Congress held in Rome, Italy, between April 5 and 10, 1959, included (1) fishing methods and deck arrangement, (2) boat types, (3) stabilities of vessels, (4) safety at sea, (5) choice of size and types of vessels, (6) propulsion, and (7) fishing vessels of the future. In this article, only some of the more interesting trends are discussed.

Stern versus side trawlers.--One of the most controversial issues was that of the stern trawler versus the side trawler. The stern trawler originally resulted from the idea of catching and processing fish on board to facilitate voyages to remote fishing grounds. The shelter deck was developed to house machinery needed for processing fish, and the high freeboard amidships prevented efficient side operation of trawling gear. Stern ramps therefore were developed to bring the net aboard.

Proponents of the new stern-trawler operation state that this technique offers longer fishing, as it requires no heaving at sea; allows a free choice of direction for trawling; and makes it unnecessary to split the contents of the cod end. Safer working conditions for the crew and easier handling of the fishing gear are other advantages cited for stern trawling.

Proponents of the conventional side-trawling technique cite the increased cost of larger vessels and the necessity for quartering the crew forward--both factors increasing costs of operation in stern trawlers.

(over)

ABSTRACTER: Kathryn L. Osterhaug

2.117 SPEEDY ALUMINUM GILLNETTERS FOR ALASKA SALMON FISHERY

Anonymous
The Fish Boat 4, 31 (July 1959)

The first aluminum fishing vessels built on the West Coast represent a major breakthrough in fish-boat design and construction. The vessels consist of ten identical 32-foot aluminum gillnetters built in Seattle, Washington, for a salmon-packing company at Kenai, Alaska.

Builders' trials on Puget Sound before the boats were sent to Alaska are said to have elicited enthusiastic comments from local commercial fishermen, who were impressed with the speed and light weight of the boats. The new boats are reported (1) to have 50 percent more carrying capacity than have boats of wood or steel construction of similar design, (2) to weigh about one-third less than does a steel boat of similar dimensions, and (3) to turn up more speed with normal engine horsepower--for example, speed on trial runs was clocked at 15 knots as compared to 8 or 9 knots for the average gillnetter. It is predicted that maintenance costs and haul-out time for these boats will be unusually low.

The 32-footers, with a beam of 11½ feet and a draft of 31 inches, are powered with 165-horsepower gasoline engines. The welded hulls are constructed of aluminum alloys that were especially developed for salt-water use. The hulls are not painted and require no surface treatment. The fish-hold capacity on each vessel is approximately 27,000 pounds.

Since these boats represent a new concept in design and materials, they will be carefully checked for actual performance on the fishing grounds.

ABSTRACTER: Kathryn L. Osterhaug

SAFE BOAT DESIGN

PLASTIC FOR HULLS

FISHING-VESSEL DEVELOPMENT

ALUMINUM GILLNETTERS

2.115

2.115

Sea behavior. -- Sea-going qualities of fishing vessels must be improved to increase fishing time and to minimize hardships on the crews. Of particular interest are experiments in seakindliness covering the prismatic coefficient. A number of tests in calm water with fish-boat models have been made, and a comparison of results shows that resistance of fish vessels is governed by the same factors as is the resistance of larger ships. Tests also have shown the advantage of a small angle of entrance, the center of buoyancy far aft, and a transom stern instead of a round stern. Model tests in waves indicate that low prismatic coefficients require less power in the seaway and provide more agreeable motions.

Criteria are needed to establish minimum stability. According to California naval architect John Pauling Jr., two factors may cause the transverse stability of a boat to differ from the predictions of the designer. One is trim, which occurs during heeling as a result of fore and aft symmetry and is neglected in the conventional computation of stability. The other is a longitudinal seaway, in particular a following sea, that changes the transverse stability of the vessel by altering the shape of the immersed form as compared with calm water situations.

Productivity and tactics. --Tradition, as well as fishing methods, determines the general arrangement of the deck. Boats of different countries may have varied layouts while employing like methods. The Congress stressed that the naval architect should consider the savings in manpower made possible by rational handling of fishing gear. Such consideration would include command of operations. A ship must respond quickly to the captain's commands in order to obtain greater catches with less effort. Engine power should give complete control and maneuverability, and commands must be transmitted to the engine as speedily as possible. The captain must also command the winches to insure efficient operation and prevent loss of fishing time.

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Stern trawling and vessels designed for multipurpose fishing obviously are on the increase. It is said that the Soviet Union expects to have 150 of the stern-trawler factoryships by 1965 and a fish production near 10 billion pounds.

Plastic and metal hulls. --There is a trend toward the greater use of steel and aluminum in small-boat construction. Aluminum for seine skiffs and small work boats is on the increase, and steel construction for small fishing boats is popular in many areas.

The use of plastic hulls and of decks made from cold-setting polyester resin reinforced with glass fiber "mat" was presented by Patrick D. de Laszlo of England. The chief advantages of plastic hulls are said to be low initial cost and low maintenance and repair costs. The largest plastic hulls in the world are being made in the United Kingdom under Lloyds' survey.

Atomic power for fishing vessels. -- A discussion of fishing vessels of the future indicated that the Japanese are studying the feasibility of and making plans for utilizing atomic power for fishing-vessel propulsion. Currently, they apparently are planning a large oceanographic research vessel that is to be powered by atomic energy.

2.1471 MODEL TESTS OF 6X6 FATHOMS FLOATING TRAWL

Anonymous
Fiskaren 35, No. 32, p. 3 (Aug. 6, 1958) (In Norwegian)
World Fisheries Abstracts 10, 11-12 (January-February 1959)

In a ship's model tank in Trondheim, Norway, tests have been made with a model of a 6 by 6 fathom floating trawl, with a total length of 24.4 fathoms. The test series were divided into two main groups: (1) with the trawl fitted with weights as depressors and (2) with hydrodynamic depressors. The following variations were tested: weights: 88, 220, 330, 440 pounds; warp lengths: 25, 50, 75, 100, 125 fathoms; distance between ships: 50.5, 69, 87.5, 112 fathoms; trawl depths: about 5, 15, 20, 25 fathoms; towing speeds: 1.5, 2.0, 2.5, 3.0, 3.5, 4.0 knots; difference in warp lengths: 2 and 61½ fathoms.

The following values were registered: the vertical opening of the trawl (in m.); the towing speed (in knots); the towing power (in h.p.); the position and behavior of the trawl. With 75 fathoms of warps out, 88 to 110 pound total weights and towing speeds around 2 to 3.5 knots give maximum opening. Using more weights does not seem practical except with relatively shorter or longer warp length, 50 fathoms or over 90 to 100 fathoms. Between 100 and 125 fathoms warp lengths, the vertical opening of the trawl will be quickly reduced regardless of the amount of weights--within practical limits.

Hydrodynamic depressors give better and more even results than weights, especially at speeds between 1½ and 3 knots. The towing resistance is also reduced, particularly at over 2½ knots.

The trawl does not appear to be sensitive to uneven warp lengths as long as this is within reasonable limits, say about 2 fathoms. When towed more obliquely the opening and the body of the

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ABSTRACTER: H. Kristjonsson

2.3 CERTAIN ENZYMES CAN PROVIDE HUMAN FOOD AND GENERAL FEED PRODUCTS FROM THE TRASH FISH OF THE SEA

Meinke, W. W. (Texas Engineering Experiment Station, College Station)
Texas Engineering Experiment Station News 10, No. 1, 3-6 (March 1959)

Surveys have indicated that 6 pounds of trash fish is taken for each pound of shrimp by the shrimp trawlers of the Texas Gulf Coast. The trawl is emptied on the deck of the vessel, and the shrimp are separated from the trash fish. The shrimp are stored in ice below deck, and the trash fish are thrown back into the fishing waters. Based on an annual consumption of about 350 million pounds of shrimp in the United States and a catch of 6 pounds of trash fish per pound of shrimp, the potential catch of trash fish could amount to more than 2 billion pounds per year.

Investigations at the Chemurgic Research Laboratory at the Texas Engineering Experiment Station have involved the application of chemical and biochemical techniques to the processing of fish, including the use of enzymes to remove the scales and viscera from fish. Such factors as temperature, species of fish, time, enzyme, and enzyme concentration are important to the removal of scale and viscera by enzyme action. The fish cleaning process essentially consists of the combined action of the enzymes native to the fish and the enzyme preparation added to the viscerating and scaling medium. That is, by the addition of certain enzyme preparations, the natural enzymes of the fish are supplemented, and the fish cleaning is accomplished in a reasonable time.

Proteolytic enzymes with a high temperature optimum are most desirable for use in visceration and scaling. In general, the protein-splitting enzymes of bacterial origin produce the most satisfactory results. The enzymatic fish-cleaning method eliminates the need for much of the hand labor associated with conventional methods. For example, approximately 4 tons of trash fish taken during shrimp trawling could be viscerated and scaled in 4 hours under proper conditions in a 1,000-gallon tank. Table 1 (see over) depicts the products that could be derived from the enzymatic process.

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ABSTRACTER: Kathryn L. Osterhaug

3.12 A NEW FLUOROMETRIC DETERMINATION OF CHLORTETRACYCLINE IN ICE

Tomiyama, Tetuo and Yone, Yasuo (Kyushu University, Fukuoka, Japan)
Food Technology 13, 370-373 (July 1959)

Introduction.--In 1957, the present investigators reported on a modified acid colorimetric method for the determination of chlortetracycline (CTC) in ice. This method in some cases gave higher CTC values than did microbiological methods. When it was learned that ultraviolet lamps are used in routine field testing for detecting CTC on poultry and that the aluminum ion enhances the yellow-greenish fluorescence of CTC under ultraviolet light, a new approach was suggested.

Purpose.--The present study was undertaken to establish a practical quantitative fluorometric method for the determination of CTC.

Standard reagents.--These consisted of (1) a 1-percent potassium alum ($KAl(SO_4)_2 \cdot 12H_2O$) solution in M/2 acetate buffer of pH 4.6 and (2) a M/50 citrate buffer of pH 5.2.

Solution series.--To prepare a stock solution for the determination of CTC in the laboratory with a Beckmann spectrophotometer, dissolve 100 milligrams (mg.) of CTC hydrochloride in distilled water, and dilute to 200 milliliters (ml.). Place 1-ml. aliquots in small test tubes, stopper, freeze, and store in freezer. To prepare standard solutions, dilute 1 ml. of stock CTC to 100 ml. with distilled water, and prepare a series of test tubes containing 2, 4, 6, 8, and 10 ml. of the diluted solution of CTC, respectively. Bring the final volume of all the tubes to 10 ml. with distilled water. This standard solution series will cover a concentration range of 1 to 5 micrograms per ml. As these standard solutions are subject to deterioration at room temperature, it is advisable to mix them with 1 ml. of the alum reagent shortly after preparation. The alum-containing standard

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ABSTRACTER: Martin Heerdt

3.12 FOOD PRESERVATIVES: TOXICOLOGICAL CONSIDERATIONS

Barnes, J. M. (Medical Research Council Laboratories, Carshalton, Surrey, England)
Chemistry and Industry No. 18, 557-559 (May 2, 1959)

Introduction.--This paper considers the toxicology of benzoic acid, sulphur dioxide, nitrites, sodium diacetate, propionates, and sorbic acid as preservatives for human foods.

Benzoic acid.--Benzoic acid has been studied more for its biochemical properties than for its value as a preservative. Benzoic acid has long been accepted as a safe preservative because it is rapidly and quantitatively excreted in the urine by man. About 90 percent appears as hippuric acid after conjugation with glycine, and the rest appears as a glucuronide--1-benzoylglucuronic acid. In man, excessive doses of benzoate produce the toxic symptoms seen in salicylate poisoning. This is a readily reversible condition and is probably related to disturbances in the acid-base equilibrium and not associated with any tissue damage. The allowable amount of benzoic acid in food provides for a large margin of safety. Small quantities of benzoic acid are rapidly and effectively disposed of by the body through a metabolic route that is capable of continued and extended use without apparent injury to the tissues.

Sulphur dioxide and sulphites.--Sulphur dioxide and sulphites are used widely in Britain, and their toxicity on rats, dogs, rabbits, and man has been studied. Large doses (over 0.7 g.) of sulphite caused dogs to vomit. Doses retained were apparently quite innocuous. Rabbits, which cannot vomit, were killed by very large doses of sulphite and were unaffected by doses not rapidly fatal. Doses of up to 4 grams were given to men; this amount sometimes caused vomiting and general abdominal discomfort. Men receiving repeated doses of 1 to 4 grams on several successive days showed an increasing tendency toward abdominal discomfort. Some sulphite is absorbed from a

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ABSTRACTER: Martin Heerdt

FLOATING TRAWL TESTS

ENZYMES FOR FISH PROCESSING

FLUOROMETRIC ASSAY FOR CTC IN ICE

TOXICOLOGY OF PRESERVATIVES

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Table 1.--Product yield and cost figures for 1 ton fish (mullet) viscerated and scaled by enzyme technique.

Products	Yield, pounds	Value, dollars
1. Edible fish	850	$19.95
Carcass		
Protein, 18.3 percent		
Total solids, 26.4 percent		
2. Fish solubles	316	15.80
Protein, 32.0 percent		
Total solids, 50.0 percent		
Oil, 6.3 percent		
3. Bones and scales meal	157	4.71
4. Fish oil	30	3.00
	Total	$43.46
Processing costs		Per ton
Fish		$20.00
Enzyme, 0.5 percent based on weight of fish		5.00
Utilities		
Water		.25
Steam		1.50
Electricity		.40
Labor, including plant manager		5.40
Patent franchise		.80
	Total	$33.35
	Gross net	$10.11

3.12

large single dose, and 1 percent of the dose may be found in the urine 15 minutes after administration. However, Rost and Franz (1913) believed that sulphite had but a fleeting existence in the body and was rapidly oxidized.

Nitrites.--Nitrities are undoubtedly toxic, and if they are absorbed, they can reduce haemoglobin to methaemoglobin, which is useless as a vehicle for transporting oxygen from the lungs to the respiring tissues. Reports have been received of babies that had over 50 percent of their haemoglobin converted as a result of receiving milk diluted with well water containing 30 p.p.m. nitrate from bacterial contamination. In this instance, the nitrate was probably converted to nitrite by bacterial action in the gut. Fortunately, cured meats containing 200 p.p.m. nitrite are not a normal constituent of the infant's diet.

Possible new preservatives.--Mention has been made of three compounds that may be introduced as preservatives in the near future. The possible new food preservatives include sodium diacetate, propionates, and sorbic acid.

After absorption, sodium diacetate will respond like sodium acetate, will be readily metabolized, and should be absolutely harmless. Propionates are found in human sweat and are among the products of rumen digestion. They can be readily oxidized, probably by way of succinate, by mammalian cell preparations. However, in large doses, propionate can interfere with acetate metabolism by preventing its oxidation and by the formation of aceto acetate.

Sorbic acid has been found to be harmless to rats and puppies at levels in the diet where benzoate exerts a deleterious effect on growth. It was found to be metabolized in the same way as are the naturally occurring caproic or butyric acids. These acids were equally ketogenic when given to fasting rats, and the condition was equally well alleviated by administering glucose. One would therefore conclude that sorbic acid is harmless for use as a preservative, but we remain in ignorance of the way it exerts its effects on micro-organisms.

2.1471

net will be partially closed and the whole trawl has an obvious tendency to twist. Tables have been worked out showing the relationship between warp length, depressors, trawling depth, trawl opening, speed and power required. For instance, 4 knots towing speed will require five times more power than 2 knots.

The tests showed conclusively that the hydrodynamic depressors are superior to the weights, that the trawl opening in vertical direction is reduced at greater depths and with long warps, and that there is an obvious and urgent need for developing a suitable instrument for registering the exact working depth of the trawl.

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solution shows a consistent fluorescence for 3 hours at room temperature. To prepare a standard solution for field determination, add to a series of flat-bottom test tubes of 27 millimeters (mm.) in diameter 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10 ml., respectively, of the diluted stock solution, and adjust the volume of all of the tubes to 10 ml. with distilled water. This standard-solution series will cover a range of 0.5 to 5 mcg. per ml. Shortly after the final dilution, mix each of the 10-ml. aliquots of standard solution with 1 ml. of the alum reagent.

Determination.--Place a representative 300-gram aliquot of ice that is to be tested in a beaker or polyethylene bag, and thaw by placing it in running water. Add 2 ml. of M/50 citrate buffer of pH 5.2 to a 50-ml. aliquot shortly after it is thawed. Allow the aliquot of standard solution with added potassium alum reagent to stand for 20 to 60 minutes at room temperature. Measure the fluorescence of the sample at a wave length of 500 mμ. Similarly, measure the fluorescence of the other alum-containing standard solutions, subtract the blank value from each measured intensity of fluorescence, and draw a standard curve by plotting the intensity of fluorescence against the concentration of CTC. Read the concentration of CTC in the ice sample that corresponds to the intensity of fluorescence from which the blank value has been subtracted.

For a routine field estimate, place 10 ml. of a supernatant sample of thawed ice in a flat-bottom test tube 27 mm. in diameter, and add 1 ml. of the alum reagent. Allow the sample to stand for 5 to 10 minutes, and observe the fluorescence that emanates from the top of the tube while being irradiated with the black-ray lamp from the side. Estimate CTC concentration of the ice sample by comparing the fluorescence of the sample with that of the tubes in the standard series.

Results.--Use of the above method produced data that showed a linear relationship between the CTC concentration and the intensity of the fluorescence of the aluminum-CTC chelate. Interference caused by the presence of the decomposition products of CTC was small. Fairly good agreement was obtained between CTC values as assayed by a microbiological method and the proposed fluorometric method. This method can be employed for field assays of the concentration of CTC in ice.

2.1471 DOUBLE RIG SHRIMPING IN THE GULF OF MEXICO

Anonymous
National Fisherman 40, 13-14 (June 1959)

A recent development in the shrimp fisheries of the Gulf of Mexico and South Atlantic Coast is the conversion of conventional trawlers from single-trawl to two-trawl rigs. With the two-trawl rig a vessel tows two small nets simultaneously rather than a single large net. This method is called double-rig trawling.

One benefit claimed for this method of trawling is that it will catch more shrimp. Many vessel operators consider that a 15 to 30 percent greater catch is possible. Some reasons advanced for the fishing superiority of the double rig are (a) that a 40- to 42-foot net is more efficient for its size than an 80- to 100-foot net; (b) that two small nets fish more efficiently over an uneven bottom than does one large net; and (c) that the total towing resistance of two 40-foot nets is less than the resistance of one 80-foot net, and therefore faster towing speed can be attained.

A second advantage claimed for the double rig is that loss of time, labor, and money spent on gear is reduced, and fishing time therefore is increased. The double rig also is safer than the single rig in that hazards such as the towing point on the after deck and the mass of overhead rigging are eliminated.

The major changes required to effect a conversion from a single- to a double-trawl rig are (1) replacement of the towing boom and the try-net boom with two outrigger booms having special blocks, (2) modification of the main boom, (3) modification of the winch, (4) replacement or modification of existing trawling warps, (5) replacement of the single large net and doors with two smaller nets and doors, and (6) relocation of the try-net hauling point.

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 ABSTRACTER: Kathryn L. Osterhaug

2.15 IMPROVEMENT IN QUALITY OF ICED WHITE FISH--BOXING AT SEA AND STOWAGE IN CHILLED SEA WATER

Anonymous
Food Investigation 1957, Report of the Food Investigation Board (Great Britain), pp. 6-7 (1958)

Boxing at sea.--Some of the previously published work by the Torry Station has suggested that the best keeping quality would be obtained if white fish were boxed with ice at sea. A comparison was made between bulk-iced fish, shelf-iced fish, and boxed-iced fish. At the request of the White Fish Authority, an examination of the possibilities of boxing, particularly in the distant-water fishery, was undertaken. Voyages were made in two distant-water trawlers, and fish from the same drag were boxed, 'shelfed,' and shallow 'bulked' at intervals throughout the fishing. Subsequent laboratory and taste-panel examination failed to show any significant advantage in boxing as compared with shallow 'bulking' or bulk stowage with no more than 18 inches between shelves. At the same time, the considerations of space and engineering design made it clear that boxing at sea would require considerable modification of the fishrooms. The conclusion is, therefore, that unless considerations of market procedure and conditions made a good case for boxing with ice, there is no point in pursuing the engineering development.

Stowage at sea in chilled sea water.--Recent experiments in North America have suggested that advantages may be gained by stowing fish on board ship either in sea water or in brine held at 30.2° F. as compared with stowage in ice. In particular, it is claimed that the fish have a better appearance and can be landed more easily and expeditiously at the wharf. One commercial vessel, approximately 80 feet long, appears to be operating successfully sea-water stowage from Vancouver, B. C., and another, about the same size and especially built for the purpose, shortly will be fishing from the same port. The White Fish Authority has requested examination of the possibilities of this method for Great Britain's fisheries.

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 Reprinted in part

3.19 STORAGE CHARACTERISTICS OF SOME IRRADIATED FOODS HELD AT VARIOUS TEMPERATURES ABOVE FREEZING. II. STUDIES WITH PORK SAUSAGE AND SCALLOPS

Licciardello, J. J.; Nickerson, J. T. R.; Proctor, B. E.; and Campbell, C. L. (Massachusetts Institute of Technology, Cambridge)
Food Technology 13, 405-409 (July 1959)

Introduction.--Pork sausage and sea scallops are two food items that do not lend themselves to sterilization by conventional heat-processing methods. Nonenzymic browning during heat processing causes scallops to change in color from light cream to dark brown. Heat processing of pork sausage causes denaturation of the hemoglobin pigment and a rendering of some of the fat from the product. Earlier studies demonstrated that pork sausage and scallops could be sterilized with high-voltage cathode rays without changing the appearance of the normal fresh products. Information concerning the behavior of these irradiation-sterilized products in storage, however, was not available.

Purpose.--This investigation was undertaken to determine the storage characteristics of irradiation-sterilized scallops and pork sausage.

Experimental methods.--A 2-m.e.v. Van de Graaff accelerator was used as a source of the ionizing radiations. Pork butts were cut into 1-inch cubes, and each 100 pounds of cubed pork was thoroughly mixed with 28 ounces of salt, 6 ounces of black pepper, and 2 ounces of sage. The spiced pork was passed consecutively through a meat grinder with a 3/8-inch plate and a meat grinder with a 1/8-inch plate. The resulting pork sausage was rolled out into sheets 1 centimeter (cm.) thick. Patties were stamped out of the sheet and vacuum packed in sardine cans. Some of the patties packed in cans were frozen at -20° F., some were heat processed and stored at 68° F., and some were irradiated with a dose of 3.5×10^6 rep and held in storage at 50°, 68°, 85°, 99°, and 125° F.

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 ABSTRACTER: Martin Heerdt

3.2493 FREEZING AND COLD STORAGE - KIPPERS AND MUSSELS

Anonymous
Food Investigation 1957, Report of the Food Investigation Board (Great Britain), pp. 13-14 (1958)

Freezing and cold storage of kippers.--Kippers made from frozen herring stored at -4° F. for 6 to 9 months usually are free from rancidity, whereas rancid flavors can be detected readily in fresh kippers frozen and held at -4° F. for the same period of time. In spite of this, many tradesmen prefer to freeze and coldstore kippers rather than herring. Kippers become rancid more quickly in cold storage than do herring chiefly because of the accelerating effect of the salt absorbed during brining on the catalytic oxidation of the fat. The partial dehydration that occurs during smoke-curing also may accelerate oxidation of the fat.

Fat antioxidants present in wood smoke, on the other hand, are deposited on the surface of the kippers during smoke-curing. An attempt is now being made to obtain quantitative information about the relative effects of wood-smoke antioxidants to learn of the possibility of improving the cold-storage properties of frozen kippers.

Four lots of kippers were smoked by a combination (1) of electrostatic deposition of smoke and (2) of drying without smoke to a moisture loss of 5, 10, 15, and 20 percent. In addition, three lots of kippers were cured to a moisture loss of 10 percent in the normal way in three different concentrations of smoke. Samples of the different lots were frozen and then stored at -7° and -20° F. for examination after 2, 4, 6, and 8 months.

To date, two examinations have been made; therefore, only tentative conclusions can be drawn from the results. The peroxide value of the fat of the kippers smoked in the normal way was slightly

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 ABSTRACTER: Martin Heerdt

DOUBLE RIG SHRIMPING

HANDLING ABOARD VESSEL

STORAGE OF IRRADIATED SCALLOPS

STORAGE OF KIPPERS AND MUSSELS

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Accordingly, four small laboratory-scale trials have been made in which codling, stored in sea water at 30.2° to 32° F. for periods ranging from 13 to 18 days, with or without aeration of the sea water and with or without 2 p.p.m. of chlortetracycline, have been compared with codling stowed in ice.

Organoleptically, there were marked differences, particularly in the appearance of the raw fish, between the lots stored in ice and those stored in sea water. In the latter, the eyes quickly became opaque, and the surface became bleached and unattractive. On the other hand, these fish, even at the end of the storage period, looked plump and were quite firm. Excluding the experiment with the antibiotic, little difference could be detected on cooking between the two lots of fish at any period during storage, apart from the distinct but not unpleasant saltiness of the fish stored in sea water.

Estimations of volatile bases showed only small differences between the two methods of storage; usually, however, these differences were in favor of the lots stowed in sea water. Obvious differences were discernible in the viable bacterial counts, and the rate of increase always was significantly greater in the iced fish. It is perhaps surprising that these bacteriological differences were not reflected more strongly in the organoleptic and chemical data. Qualitative differences in the flora may perhaps have been responsible.

The fish stored in the presence of 2 p.p.m. of chlortetracycline remained edible for about 5 days longer than did the iced fish, a finding that is supported by the chemical and bacteriological data.

As was already mentioned, the fish in sea water gradually increased their salt content during storage from an initial value of about 0.12 percent to about 10 times this amount after 14 days in sea water. The taste panel easily discerned this saltiness in the cooked fish but offered no objections to it. Whether it would be generally acceptable or would introduce other complications such as shortening the subsequent cold storage of the fish is not known.

Further investigations are in progress so that a proper assessment can be made of this method in regard both to quality of product and to engineering problems involved. Even if advantages in preservation can be conclusively shown, the method will require further development in order to overcome difficulties of engineering and ship design before it can be applied to trawlers of orthodox type, especially the distant-water vessels.

3.2493 (Cross Reference: 3.4)

higher than that of the fat of the kippers smoked electrostatically; the tasters, however, preferred the normal kippers. A clear-cut indication of an improved storage life is not as yet apparent as a result of smoking kippers more heavily than is normally done in the Torry mechanical kiln. Kippers cured to a loss of 10 percent moisture, however, appear to be optimum for freezing and cold storage.

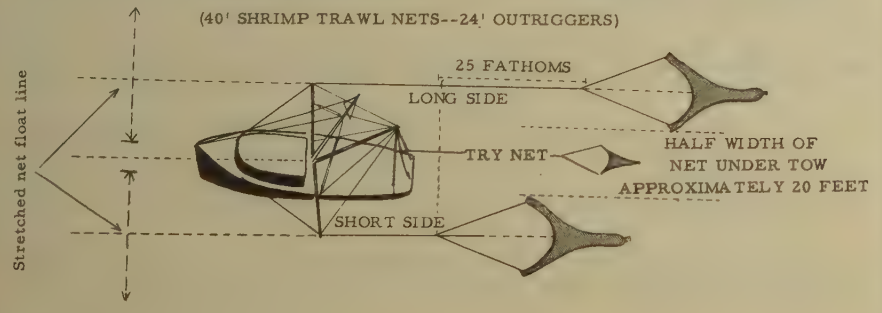
Freezing and cold storage of mussels.--A satisfactory exploitation of the abundant supplies of mussels available in many areas around the coast of Britain presents difficulties. One of the difficulties is related to a seasonal variation in mussel quality. Mussels are at their best only during the autumn and winter months. Freezing and cold storage, however, could be employed to hold mussels collected in the autumn and winter for marketing in the spring and summer. Recently, the Ministry of Agriculture, Fisheries, and Food asked for information about the cold-storage properties of cooked mussel meats. Experimental studies with mussel meats were made to learn the effect of a number of different treatments on the texture and quality of mussels preserved by freezing.

Treatments investigated were (1) the effect of boiling water, boiling weak brine, or steam, used in opening the shells; (2) the effect of rapid or slow cooling after shucking; (3) the effect of different types of packages; and (4) the effect of storage at -7° and -20° F. Freezing and cold storage did not adversely affect the texture of cooked mussels; however, a slight preference was indicated by tasters in the laboratory for the products that had been cooked in steam and rapidly cooled with water before being frozen.

Ample evidence was present to show that satisfactory frozen products were obtained by using 3-ounce and 1-pound packages. Mussels frozen in a weak brine solution developed slight off-flavors similar to incipient rancidity during cold storage. Frozen mussels held for 6 to 9 months at -20° F. were satisfactory, whereas changes in flavor were easily detected in frozen mussels held for 3 to 4 months at -7° F.

2.1471

Two outrigger booms replace the original single towing boom and try-net boom. The outriggers, usually 24 feet long, are mounted on the mast pad eyes or are fitted to a gooseneck. Materials, construction details, and rigging arrangements vary throughout the shrimp fleet.



Double-rigged shrimp trawler showing position of nets when being towed.

3.19

Fresh sea scallops were sliced across the grain of the muscle to obtain discs that were 1 cm. in thickness. The sliced scallops were blanched in live steam at 212° F. for 4 minutes to inactivate proteolytic enzymes and were cooled in running tap water for 10 minutes to leach out reducing sugars and other components that might participate in nonenzymatic browning reactions. The blanched scallops were packed under vacuum in sardine cans with 1-percent brine and frozen at 0° F. Some of the scallops in cans were irradiated in the frozen state with a dose of 3×10^6 rep. This prevented the scallops from moving when the can was inverted during irradiation. Unirradiated scallops in cans were stored at 0° F., whereas the irradiated scallops were stored at temperatures ranging from 50° to 125° F. Heat-processed scallops in cans were not prepared, owing to the poor texture and color that result from heat processing.

Preparation of samples for flavor testing.--Scallops were rolled in flour and pan-fried in hydrogenated fat. Pork sausage patties were broiled in an electric oven. These products were served without any additional seasoning.

Results.--An irradiation dose of 3 million rep in the case of scallops and $3\frac{1}{2}$ million rep in the case of pork sausage rendered these products commercially sterile. Standard plate counts and "most probable number" of anaerobes remained at an insignificant level throughout 8 to 10 months of storage at 50° to 125° F. A significant difference in flavor was noted between samples of nonirradiated and irradiated pork sausage immediately following irradiation. The flavor of the irradiated product, however, was not found to be objectionable by the taste panel.

Irradiated pork sausage held at 50° F. was considered acceptable in flavor after 8 months of storage, whereas irradiated pork sausage held at 68° F. or above became unacceptable in flavor after 2 months of storage. Irradiated scallops held at 50° or 68° F. were considered to be acceptable after 10 months of storage; however, a marked deterioration in quality occurred in irradiated scallops held at 125° F. after 1 month of storage. Nonenzymatic browning, which caused off-flavor and color degradation, was primarily the reaction responsible for the deterioration of irradiated scallops during storage, but texture losses also occurred. Changes in texture and associated off-flavors resulting from proteolytic enzyme action were primarily responsible for the loss of quality in irradiated pork sausage, but color changes and fat oxidation also occurred.

3.2495 FREEZING AND COLD STORAGE - PROTEIN DENATURATION AND FREEZING OF WHITE FISH AT SEA

Anonymous
Food Investigation 1957, Report of the Food Investigation Board (Great Britain), pp. 11-13 (1958)

Protein denaturation.--The solubility of fish-fillet protein in 5-percent sodium chloride decreases when fish fillets are stored in the frozen state. Basic studies in regard to solubility now have been brought to a useful stage.

The study of the natural variation in the solubility of North Sea cod-muscle proteins described in the 1956 report and elsewhere has been extended to cover seasonal variation over a period of 14 months. Fresh cod muscle that had less than 2 percent variation in salt-soluble protein was used in the freezing and cold-storage studies. This muscle was obtained by dissecting out myotomes or muscle flakes number 8 to 16 inclusive, counting from the anterior end of the fillet. Myotomes were cut free of myocommata or connective tissue sheets from fish under 28 inches in length that had been caught during the months of April to November, inclusive. The standard deviation in the soluble protein from one group of fish increased from less than 1 percent in the unfrozen fish to about 5 percent after the fish had been frozen and thawed. A freezing time of as long as 8 hours did not significantly affect the soluble-protein values.

In an experiment performed with a large number of samples, the soluble protein in fillets stored at 6.8° F. decreased steadily without a plateau in the curve. Denaturation was complete after 15 weeks at 6.8° F., and the amount of soluble protein did not decline further, even if storage was prolonged to about 4½ years.

Freezing of white fish at sea.--Quick-freezing the early part of the white-fish catch from distant

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 ABSTRACTER: Martin Heerdt

3.60 FREEZE-DRYING LOOKS UP

Patton, Paul W. (NRC Equipment Corp., Cambridge, Massachusetts)
Food Engineering 31, 78-80 (June 1959)

Introduction.--A detailed study was completed recently to learn the cost of building a plant for the freeze-dehydration of fish viscera for use as mink food. The freeze-dehydration of low-cost trash fish would not be economically practical except for the fact that mink are valuable animals and that they have delicate digestive systems. The plan of this study is as follows: frozen blocks of fish viscera are fed into a coarse ice crusher on a second floor that discharges into a fine ice crusher on the first floor and then into dryers that discharge into the basement. The dryers are located side by side to enable alternate loading from the same crusher. Other equipment is placed to minimize piping and effectively utilize floor space.

Design.--This plant is envisioned as being located at a coastal point where ice from the ice receiver of the dryer can be discharged onto a covered wharf and dumped directly into the water. Ammonia condensers are located on the edge of the wharf to utilize sea water for cooling. Planned manual operations include loading and unloading of the dryers and discharge of the ice receivers. The system is designed so that manual servicing of the dryer and condensers occurs only once every 12 hours. All utilities and services are intended for around-the-clock automatic operation.

The drying cycle.--One satisfactory method of following the progress of the drying cycle is a direct comparison of the temperature of the material being dried with that of the heating medium in the dryer shell. This requires two-point recording instruments that produce a circular-chart record of temperatures. As drying progresses, the temperature of the frozen material remains below 0° F., whereas that of the heating liquid in the dryer jacket remains steady at about 150° F. As the drying cycle reaches mid-point, the moisture content of material declines until ice no longer exists, and the

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 ABSTRACTER: Martin Heerdt

3.331 TUNA IN AGAR JELLY

Anonymous
Commercial Fisheries Review 21, 66 (May 1959)

After they were precooked, the skipjack loins were cleaned just as for packing in oil. They were then immersed in water at 80° to 90° C. (176° to 194° F.) for 5 minutes to facilitate division to flakes ("myomeres"). The loins were then pulled apart by hand; a few large segments were packed in the can first, after which the can was filled with flakes and weighed. Finally a few large pieces were put on top of the flakes to give a good appearance when the can is opened.

The can was next filled with a measured amount of hot jelly at about 30° C. (86° F.), vacuum sealed, and retorted for 80 minutes at 7 pounds of pressure.

The yield from this lot of skipjack was 161.17 cases of canned tuna in jelly, 31.13 cases of No. 5 cans for the domestic market, and 9.3 cases of flake tuna. Recovery is given as one case of forty-eight 7-oz. cans of jellied tuna per 13.976 kg. (30.7 pounds) of raw fish.

The formula for the jelly sauce used in this pack is as follows (quantity per case in parentheses): 7.2 kg. powdered agar (58.06 g.), 4.8 kg. cellulose gluconic acid (38.7 g.), 6.0 kg. gelatin (48.4 g.), 0.72 kg. pepper (5.8 g.), 28.8 kg. powdered skim milk (232.3 g.), 25.1 kg. fresh onion juice (202.4 g.), 4.41 kg. refined white sugar (35.56 g.), 15.6 kg. salt (126.8 g.), 5.25 kg. cottonseed oil (42.3 g.), 2.4 kg. monosodium glutamate (19.3 g.), 0.6 kg. water, 48 cc. spice mixture "A" and 150 cc. spice mixture "B" (apparently standard food flavoring mixtures imported from the United States).

 Reprinted in part

3.60 A STUDY OF EVAPORATION AND DIFFUSION PROCESSES IN THE DRYING OF FISH MUSCLE

Jason, A. C. (Torry Research Station, Aberdeen, Scotland)
Fundamental Aspects of the Dehydration of Foodstuffs, 1958, The Society of Chemical Industry, 14 Belgrave Square, London, England, pp. 103-135 (Reprinted)
Torry Memoir No. 2 (1959)

About one-third of the annual world yield of fish and fish products is heavily salted, dried, or smoked.

Although most methods of preserving fish are traditional and often primitive, modern techniques must be applied to obtain closer control of the process in order to produce a uniform product.

In processes such as smoke curing and salting, drying is an essential part of the procedure. To obtain better control of fish-processing techniques that involve drying, basic data on drying should be available and utilized in conjunction with a comprehensive knowledge of the fundamental principles involved. The purpose of the investigations reported in this publication was to provide this information.

The fact that the initial rate of drying is determined by external conditions has been well established. The period during which these conditions are dominant is known as the constant-rate period and is terminated when the supply of water to the surface is no longer capable of supporting the established rate of drying. The rate of drying from then on decreases continuously. During the falling-rate period, the mechanism of internal flow dominates the rate of drying. For fish muscle, the constant-rate period appears to occupy a significant portion of the total drying time during most

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 ABSTRACTER: Kathryn L. Osterhaug

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light-curing processes, whereas when the flesh is almost completely dried, the falling-rate period constitutes most of the drying time.

Conclusions.--During the initial stages of drying, the rate of evaporation of water from the surface of fish muscle is constant and equal to that from a saturated surface of the same shape. The duration of this constant-rate period is related to the rate of evaporation per unit area, the effective diffusion constant, the dimensions of the sample, and the free water concentration.

The transition from the first to the second phase of the falling-rate period appears to be associated with the uncovering of the unimolecular layer of water that covers the protein molecules. The activation energy for diffusion is found to be greater in the second phase than it is in the first, and the difference corresponds approximately to the difference between the heat of adsorption of the monolayer and the heat of liquefaction of the water. If this is correct, then the processes of evaporation and diffusion may be characterized by a scheme of energy levels involving the heat of adsorption of the unimolecular layer of water, the heat of liquefaction of water, and the energies of activation corresponding to each of the two phases of the falling-rate period.

During both the constant-rate and the falling-rate periods, the drying behavior of all species of nonfatty fish so far examined is identical. The effect of the presence of fat is to decrease the values of the effective diffusion constants in the first and second phases of the falling-rate period. One consequence of such a decrease in the former value is to reduce the duration of the constant-rate period.

Brining of muscle results in an early transition from the first to the second phase in the falling-rate period. In the first phase, the effective diffusion coefficient does not differ significantly from that for unbrined fish, but in the second phase, the coefficient is considerably less than the corresponding value for unbrined fish. The combined effect of a short first phase and a very low effective diffusion coefficient in the second phase explains why salt fish takes considerably longer to dry than does unbrined fish.

3.2495 (Cross Reference: 2.118)

waters would, if adopted, result in improvements in the average freshness of the catch. The White Fish Authority, the Ministry of Agriculture, Fisheries, and Food, and the Distant Water Vessel Owners' Development Committee were concerned jointly in a commercial-scale experiment (1) in which the installation and operation of a freezing plant on the Grimsby trawler Northern Wave were supervised by the Torry staff and (2) in which the technical feasibility of the process was demonstrated. A special report containing full technical details and recommendations for the layout and specifications of a plant for a 185-foot steam trawler has been prepared and published by the White Fish Authority. The development (1) of the quick-freezing plant from a Torry prototype and (2) of the cold-storage installation also is described. The experiment provides an excellent example of successful collaboration in developing the results of research on a full commercial scale.

By freezing the early part of the catch, the economics of distant-water fishing may be improved because fish can be saved for human consumption. A study of the operations of the distant-water fleet has been initiated to determine what the overall economical advantages might have been if the present vessels had been equipped with a suitable freezing and cold-storage plant. The study also will determine if the space occupied by the main engines and the fuel tanks might be reduced and the space occupied by the freezers might be increased. This would permit more time on the fishing grounds. Improved methods of preservation such as freezing instead of the use of high-speed vessels will result in a considerable saving in fuel in addition to the advantages of freezing that were mentioned earlier. Voyage studies made to date indicate that in the latest Arctic trawlers, at least half of the power installed has the sole effect of providing greater speeds in transit.

Development of the vertical-plate freezer for use at sea is continuing. Improvements in performance indicate that the space required for freezing may be reduced.

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product temperature begins to rise. At this point, the two temperatures approach one another. In the final stage of drying, the temperature of material being dried reaches that of the heating liquid.

Equipment operation.--Particles of frozen viscera are charged into the dryers and stirred with rotary blades to insure uniform heating and exposure to vacuum. Water vapor from the product being dried condenses out onto the walls of the rotary condenser, is scraped off in the form of snow, drops into the receiver, and is removed at the end of the cycle. A central panel enables the operator to control all phases of the process. This included recorders that monitor critical temperatures throughout the equipment and remote controls for the vacuum valves.

Production costs.--The total estimated cost of producing 4,000,000 pounds of raw feed per year is approximately $195,000. This is a cost of 4.9 cents per pound of raw feed produced or 6.1 cents per pound of water removed and includes fixed capital, labor, and utilities.

4.11 CARBONYL COMPOUNDS AS A CRITERION OF FLAVOR DETERIORATION IN EDIBLE FATS

Berry, N. W. and McKerrigan, A. A.
Journal of the Science of Food and Agriculture 9, 693-701 (November 1958)

Introduction.--The relationship between off-flavors in oils and their content of carbonyl compounds (aldehydic or ketonic) has been well established, and similar evidence is accumulating regarding other materials containing fat, such as milk and milk products. Evidence thus suggests that by measurement of the content of carbonyl compounds in a particular fat, more exact information may be obtained concerning the state of oxidation of the fat, with results that are more in line with the development of off-flavors.

It is apparent that the carbonyl products of rancidity may be either volatile or nonvolatile, saturated or unsaturated. Methods of an empirical nature that have been recommended for measuring total carbonyl compounds and a method that gives a measure of the volatile carbonyl compounds in the form of an arbitrary constant called the carbonyl index are considered.

Discussion.--Carbonyl compounds, rather than hydroperoxides, are likely to be responsible for the disagreeable flavor of oxidized fats and oils. The carbonyl value of a fat may be measured by the formation of dinitrophenylhydrazones of these compounds. Their red color in alkaline solution is measured spectrophotometrically at 430 and 460 millimicrons.

Saturated and unsaturated carbonyls may be determined in this way, and their sum--millimols per kilogram of oil--is the carbonyl value. Typical values for deodorized oils are: peanut 6.0, cottonseed 18.0, and soybean 8.0. Volatile carbonyls are calculated to a carbonyl index, which increases as oils become oxidized. For example, freshly deodorized soybean oil had a carbonyl index

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ABSTRACTER: June H. Olden

4.11 DETERMINATION OF STRUCTURE AND ANALYSIS HIGHLY UNSATURATED AND SATURATED ACIDS IN FISH OILS

Privett, O. S. (The Hormel Institute, Austin, Minnesota)
Annual Report of the Hormel Institute 1956-57, pp. 47-50 (1957)

The objectives of the research reported here were (1) to determine the structure of highly unsaturated fatty acids (4, 5, and 6 double bonds) of representative fish oils and (2) to devise on the basis of structure, suitable methods for the partial or complete analysis of the fatty acids of fish oils.

The fatty acid esters of menhaden and tuna oils were subjected to an elaborate scheme of fractionation to concentrate the more highly polyunsaturated fatty acid esters. The fractionation was followed by determination of the iodine value, by alkali isomerization, and by paper chromatographic analysis. The esters were separated according to chain lengths by distillation through a Podbielniak spinning band fractionation column. On the basis of these analyses, the following acids in menhaden oil have been identified in appreciable amounts: C_{16} diene, C_{16} tetraene, C_{18} diene, C_{18} tetraene, C_{20} pentaene, and C_{22} hexaene. Analyses by paper chromatography indicate the presence in menhaden oil of four unsaturated C_{16} acids and four unsaturated C_{18} acids. Only a pentaenoic acid has been detected in the C_{20} group; and pentaenoic and hexaenoic acids, in the C_{22} group. Monoenoic, dienoic, trienoic, and tetraenoic acids also are probably present in the C_{20} and C_{22} groups.

In the single polyunsaturated fraction of tuna oil that thus far has been examined, docosahexaenoic and eicosopentaenoic acids were found in appreciable amounts.

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ABSTRACTER: Kathryn L. Osterhaug

CARBONYL COMPOUNDS IN OILS

FATTY ACID STRUCTURE

4.21 CHEMICAL AND KINETIC STUDIES ON THE AUTOXIDATION OF FATTY ACID ESTERS

Privett, O. S. (The Hormel Institute, Austin, Minnesota)
Annual Report of the Hormel Institute 1956-57, pp. 7-12 (1957)

Evidence was obtained that, in addition to hydroperoxides, other products are formed in significant amounts in the autoxidation of methyl oleate even under very mild conditions. The major difference observed in the samples of methyl oleate autoxidized under different conditions was a decrease in the amount of unsaturation which appeared to be associated with the extent of the autoxidation.

Studies on the nature of the secondary reaction taking place in the autoxidation of methyl oleate showed that relatively pure oleate hydroperoxides undergo further oxidation by molecular oxygen without any appreciable changes in the peroxide value as determined by iodimetry. The site of the reaction is believed to be at the unsaturated linkage and the hydroperoxide group does not appear to be directly involved.

Studies on the structures of the isomeric hydroperoxides formed in the autoxidation of methyl oleate confirmed an earlier finding that four isomers are produced in accordance with the theory of allylic resonance.

Observations of the infrared spectral characteristics of various acetyl derivatives provided experimental evidence that the hydroperoxide group formed in the autoxidation of methyl oleate occupies a position α to the olefinic linkage.

Author's summary

4.21 A STUDY OF THE ODOR PROBLEM IN FISH OILS

Chipault, J. R. (The Hormel Institute, Austin, Minnesota)
Annual Report of the Hormel Institute 1956-57, pp. 50-54 (1957)

The objectives of this investigation were (1) to determine the nature of the chemical reactions involved and the products formed in the development of undesirable odors during the storage of fish oils and (2) to obtain information that can be used to devise practical methods of preventing the development of odor in fish oils.

The volatile compounds that form during the oxidation of fish oils have been shown to contain a large percentage of carbonyl compounds. Separation of the 2,4-dinitrophenylhydrazones of these carbonyl compounds by paper and column chromatography indicated the presence of several aldehydes. More recently, paper and column chromatography have been used to separate and identify these compounds further. Attempts also have been made to separate the volatile compounds and to identify fractions that are responsible for the typical odor.

Propionaldehyde, which is known to be present, and other aldehydes of low molecular weight, which may also be present, do not possess the odor typical of fish oils. Most of the carbonyl compounds that are formed during the oxidation of fish oils appear to be dicarbonyl compounds. They have not been separated by any paper or column chromatographic technique tried. In addition to these carbonyl compounds, it appears possible that other oxygen-containing noncarbonyl compounds, and even hydrocarbon compounds, may partially be responsible for the typical odors of oxidized fish oils.

This work was supported by funds provided by the Bureau of Commercial Fisheries.

ABSTRACTER: Kathryn L. Osterhaug

AUTOXIDATION OF METHYL OLEATE

ODOR OF FISH OILS

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This work was supported by funds provided by the Bureau of Commercial Fisheries.

Table 6.--Analytical data on the polyunsaturated methyl esters

Fraction number	Chain length	Iodine value (Wijs)	Number of unsaturated components		Alkali-isomerization analysis (180° C., 15 min., 21% KOH-glycol method)				
			Major	Minor	k_{233}	k_{268}	k_{315}	k_{346}	k_{374}
Menhaden oil									
1	16	152	2	2	26.0	10.9	8.1	0.37	0.04
2	16	313	1	2	74.5	60.0	53.5	3.26	0.30
3	18	205	1	3	35.0	26.8	22.3	2.09	0.16
4	20	387	1	1	46.1	41.2	77.0	75.5	3.48
5	22	403	1	1	81.5	77.5	80.0	78.0	56.5
Tuna oil									
1	20	354			43.7	38.3	69.7	62.5	2.35
2	22	412			54.5	48.2	57.5	60.0	47.0

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of 28, which went up to 2320 after 6 days of storage at 140° F.

Fats may have fairly high peroxide numbers without much change being noticeable in their flavors. These fats will have low carbonyl indices. On heating, peroxides may be destroyed, but carbonyl indices will increase, corresponding closely to the development of rancid flavors.

4.21

4.29 INVESTIGATION OF CHEMICAL REACTIONS OF FISH OIL FATTY ACIDS

Schlenk, Hermann (The Hormel Institute, Austin, Minnesota)
Annual Report of the Hormel Institute 1956-57, pp. 54-57 (1957)

This investigation is part of a program initiated by the U. S. Bureau of Commercial Fisheries to find new uses for the components of fish oils.

The fatty acids of marine oils are distinguished from those from other sources by two characteristics: a broad spectrum of chain lengths and high unsaturation. Many commercial fats consist almost exclusively of fatty acids with 16 and 18 carbon atoms, whereas the fish oils contain considerable amounts of fatty acids with 14 to 22 carbon atoms each. All chain lengths are represented both by saturated and unsaturated acids, some of which are very scarce in other commercial fats.

When autoxidized oils with peroxide values of approximately 500 are treated with thiourea in methanol solution and then reisolated, their peroxide values are greatly reduced. Hydroxylated acids may be expected to result from this reaction. The double bonds, though isomerized by autoxidation and possibly by the subsequent reaction with thiourea, should still be present. The possibility of arriving at hydroxylated unsaturated fatty compounds by a simple procedure indicated a closer study of the thiourea reaction.

Methyl linoleate hydrogen peroxide was prepared according to the method of Privett, Lundberg, and Nickell. Its peroxide value (P. V.) was 6600 instead of the theoretical value of 6125, thus indicating the presence of di-peroxide substances. A 1.0-gram portion of the clear liquid peroxide was treated at 0° for 2 hours with 250 milligrams of thiourea in 20 milliliters of absolute ethanol. White crystals appeared a few minutes after the reactants had been mixed, and at the same time, some

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 ABSTRACTER: Kathryn L. Osterhaug

5.112 UTILIZATION AND STABILITY OF COMMERCIAL VITAMIN A SUPPLEMENTS

Olsen, Ellen M.; Harvey, J. D.; Hill, D. C.; and Branion, H. D. (Ontario Agricultural College, Guelph, Ontario, Canada)
Poultry Science 38, 929-942 (July 1959)

Introduction.--Dry preparations of vitamin A that have appeared on the market in recent years are stabilized by the addition of an antioxidant and by encapsulation in an aerophobic matrix, such as gelatin, ethyl cellulose, gum acacia, wax, or hard fat. In some products, the vitamin is adsorbed to wax, fat, or particles of a carrier such as a plant product. Synthetic vitamin A palmitate or acetate and fish oils are the main sources of vitamin A in these preparations. These products represent considerable progress in the conservation of vitamin A; however, the stabilization process could be carried so far that the vitamin would become unavailable to the animal organism. The protective mechanisms most commonly used against oxidation are encapsulation with gelatin or with lipids. These mechanisms also permit control of solubility, digestibility, and in some instances, absorbability.

Purpose.--The work reported here was a study under practical conditions of the utilization of several commercial, dry vitamin A supplements by chicks. At the same time, the authors tested the stability of vitamin A supplements in stored poultry feed by comparing utilization after periods of storage.

Experimental.--Comparisons were made of the availability and stability of a vitamin A feeding oil, carotene in dehydrated cereal grass, and several commercial, dry vitamin A preparations during storage in a mixed ration. Criteria for comparison were liver storage of vitamin A, growth, and mortality. Diets were fed (1) freshly mixed for the experiments on availability and (2) after 5

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 ABSTRACTER: Martin Heerdt

4.3 SOLUBILITY AND FRACTIONATION OF LIPIDES IN SULFUR DIOXIDE

Schlenk, Hermann, and Ener, Marita A. (The Hormel Institute, University of Minnesota, Austin)
Journal of the American Oil Chemists' Society 36, 145-149 (April 1959)

Introduction and purpose.-- Cox and Reid (1932) fractionated unsaponifiable lipides from a marine source into saturated and unsaturated portions by Soxhlet extraction with SO_2 at atmospheric pressure. These authors indicate that when the same procedure is applied to fatty acids, considerable amounts of saturated material are extracted along with the unsaturated components. This study was made to determine the solubilities of some long-chain fatty acids and methyl esters in SO_2 at temperatures between -50° and 25° C. Methyl esters of unsaturated fatty acids are known to be highly soluble in this solvent. With solubility data as a guide, mixtures of lipides were fractionated in SO_2 under atmospheric pressure at -10° C., which is below the boiling point of SO_2.

Discussion.--Solutions of saturated acids and esters in SO_2 are colorless, whereas those of unsaturated lipides are yellow. When SO_2 is evaporated to recover the solutes, unsaturated lipides are obtained as yellow oils that are difficult to decolor under high vacuum. The last traces of SO_2 may easily be removed by washing the solutions of such lipides in an inert solvent with water or dilute alkali to obtain recoveries of 95 to 99 percent. Neither ultraviolet or infrared spectra nor iodine values were changed when linoleic and linolenic acids were dissolved and stored in SO_2 for a day or longer at -20° to -30° C. Storage at room temperature causes slow darkening to a brown oil that is partly insoluble in petroleum ether. The soluble fraction can be decolorized by washing, as above, after which the lipides appear unchanged The solubilities of saturated esters remained unchanged after storage for 1 to 3 days in SO_2 at room temperature, indicating that the esters also remain unchanged.

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 ABSTRACTER: Martin Heerdt

6.139 POSSIBLE TOXIC FACTOR OF TRICHLOROETHYLENE-EXTRACTED SOYBEAN OIL MEAL

McKinney, L. L.; Picken, J. C., Jr.; Weakley, F. B.; Eldridge, A. C.; Campbell, R. E.; Cowan, J. C.; and Biester, H. E. (The Veterinary Medical Research Institute, Iowa State College, Ames)
Journal of the American Chemical Society 81, 909-915 (February 20, 1959)

Introduction.--Earlier studies in the authors' laboratories have shown that the bovine aplastic anemia-causing factor in trichloroethylene-extracted soybean oil meal is (1) associated with the purified protein component of the meal, (2) labile to vigorous acid hydrolysis, and (3) subject to measurable loss in toxicity on heating of the alkaline (pH 11 to 12) protein dispersion at 60° C. for 4 hours. Picken and Biester (1957) have shown that the aplastic anemia-causing factor is formed by heating zein, casein, lactalbumin, and gelatin--as well as soybean protein--with trichloroethylene at 120° C.

Purposes.-- The present paper described the findings that prompted the synthesis of S-(dichlorovinyl)-L-cysteine, which on oral administration to calves produced an aplastic anemia syndrome typical of that produced by trichloroethylene-extracted soybean-oil meal.

Biological response to S-dichlorovinyl derivatives.--After 5 to 7 days, calves on dosages of 200 to 1000 milligrams (mg.) of S-(dichlorovinyl)-L-cysteine per day per 100 pounds (lb.) of calf weight were too weak to consume feed. To revive the appetite of the calves, the toxic compound was withheld from the milk for 1 or 2 days and readministered at reduced levels without the debilitating effects of the larger dosages. A clinical disease syndrome developed very rapidly, and both calves were moribund on the 14th day. At necropsy examination, both calves exhibited the typical severe

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 ABSTRACTER: Martin Heerdt

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The curves of solubility versus temperature for fatty acids and methyl esters in liquid SO_2 resemble those obtained with organic solvents in that they vary with chain length and unsaturation. Fatty acids, however, are considerably less soluble in SO_2 than in common organic solvents; whereas in nitromethane, nitrobenzene, furfural, and similar solvents, the solubilities may be even lower than they are in SO_2. Acetone was chosen as a comparison solvent.

Within the range that has been measured, plots of logarthmic values of the mole fractions of acids and methyl esters soluble in SO_2 and in acetone appear as straight lines that are nearly parallel for the saturated C_{12}, C_{14}, C_{16}, and C_{18} acids. In plots of the logarithmic values of unsaturated acids, oleic acid deviates most from the pattern, and this deviation was found to persist in two different preparations that did not contain any detectable impurities. Methyl esters of fatty acids usually are more soluble than the corresponding acids. The differences, however, are particularly pronounced in SO_2; and this makes possible the efficient separation of an acid from its ester.

For the separation of lipides in SO_2, it was necessary to use extraction rather than crystallization procedures because the amount of sample that dissolved completely below -10° was too small to be useful. However, in low temperature fractionation, the efficiency of SO_2 approximates that of acetone. Mixtures derived from menhaden oil were fractionated. For further comparison, attention is called to the work of Smith and Brown (1945), who fractionated such mixtures in methanol, acetone, or Skellysolve F. It appears that for this purpose, liquid SO_2 is at least equivalent to organic solvents.

Summary of results.--The solubilities of several fatty acids and their methyl esters in SO_2 have been determined as a function of temperature. SO_2 dissolves much smaller amounts of acid than do the organic solvents commonly used with lipides. In this respect it resembles solvents of high polarity, such as nitromethane, acetonitrile, or furfural. Methyl esters are more than a hundred times more soluble in SO_2 than are the acids. Acids, methyl esters, and glycerides can be fractionated efficiently in SO_2.

6.139

lesions characteristic of aplastic anemia of the bovine as induced by trichloroethylene-extracted soybean-oil meal. Calves fed S-(dichlorovinyl)-L-cysteine at levels of 10 to 50 mg. per day per 100 lb. of calf weight presented the typical clinical picture associated with the consumption of toxic trichloroethylene-extracted soybean-oil meal. Calves on the 15- and 20-mg. levels of S-(dichlorovinyl)-L-cysteine per day per 100 lb. of calf weight compared very favorably with calves on the 127- and 190-gram levels of highly toxic trichloroethylene-extracted soybean-oil meal. Even the 10-mg. level, which caused deaths after about 60 days of feeding, produced a more severe effect than did commercially prepared trichloroethylene-extracted soybean-oil meals fed at commercial levels.

Studies on the enzymic hydrolyzate of toxic trichloroethylene-extracted soybean-oil-meal protein.--The wet curd was isolated as previously described by the authors and digested with pepsin, crude trypsin, and erepsin, consecutively, which resulted in the hydrolysis of 44 percent of the peptide bonds. A comparison of the spray-dried hydrolyzate in feeding tests with the unhydrolyzed protein indicates that better than one-half of the toxicity was lost during the 9 days of enzymic digestion.

Summary of results.--Treatment of amino acids and peptides with trichloroethylene under conditions known to produce the bovine aplastic anemia-causing factor in soybean-oil meal and other proteins showed that trichloroethylene reacted readily with the sulfhydryl groups of cysteine and reduced glutathione. The S-dichlorovinyl derivatives of L-cysteine and L-glutathione were synthesized and found to produce the aplastic anemia syndrome in calves typical of that produced by trichloroethylene-extracted soybean-oil meal. The stability and properties of the S-dichlorovinyl derivatives are in agreement with known properties and mode of formation of the toxic principle in the meals. Enzymic hydrolysis of a toxic protein from trichloroethylene-extracted soybean-oil meal resulted in the loss of a large portion of its toxicity. The results of chromatographic studies of the hydrolyzate indicated the presence of products resembling the synthetic compounds. These products gave positive tests for the S-dichlorovinyl group.

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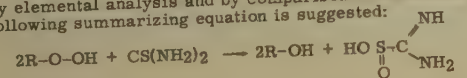
opalescence was observed, the latter caused by elementary sulfur. The white crystals were filtered off, and an oil with a P.V. of 480 was obtained from the mother liquor. Comparison of the ultraviolet spectra before and after treatment with thiourea revealed 15-percent loss of conjugation during the procedure. The oil was re-treated with thiourea at room temperature, but the peroxide value could be lowered no further.

Methyl oleate hydrogen peroxide with a P.V. of 6050 was isolated. Reacting this material with thiourea yielded an oil having a P.V. of 56. Some crystals again were isolated from the reaction mixture, and traces of sulfur were found in the oil that resulted from the reduction.

The crystals encountered in these reactions were identified as amino-imino-methanesulfinic acid by elemental analysis and by comparison with authentic samples prepared by other methods. The following summarizing equation is suggested:



$$2R\text{–}O\text{–}OH + CS(NH_2)_2 \longrightarrow 2R\text{–}OH + HO\,S(O)\text{–}C(=NH)\text{–}NH_2$$

Paper chromatography of the peroxides and the compounds derived from them has been worked out. This method, in combination with countercurrent distribution, is an efficient tool for studying autoxidation products.

5.112

weeks to 4 months of storage for experiments on stability. All of the experimental diets were prepared from a basal diet by adding the required amount of the vitamin A or carotene supplement under investigation. Since the authors wanted to carry out these experiments under practical conditions, they decided to add the dry vitamin A supplements according to the potency guaranteed by the manufacturers.

The dry vitamin A concentrates used in the experiments were as follows: (1) acetate in gelatin; (2) palmitate in gelatin; (3) palmitate in gelatin, starch, and sugar; (4) esters on flaked vegetable protein; (5) oil blended with wheat-germ meal and soybean-oil meal and then sealed into the carrier with micro-crystalline wax; and (6) oil as dry concentrate encapsulated in hydrogenated fat of critical melting point and dispersed throughout a finely divided base of defatted, enzyme-inactivated soybean flour.

Columbian Rock chicks, the progeny of a flock of hens that had been maintained carotenoid-free and vitamin A deficient for three or four generations, were used in all experiments. Newly hatched chicks of mixed sexes were assigned to the treatment groups at random and were fed the test diets for periods of 4 to 7 weeks. They were kept in electrically heated, wire-floored battery brooders in rooms maintained at 70° to 75° F. Feed and water were provided ad libitum. The vitamin A content of the chick diets was varied between 600 and 1,800 I.U. per pound in order to approximate the lowest level consistent with reasonable growth, egg production, and hatchability. At the termination of the experiment the chicks were killed, their sex was determined by post-mortem inspection, and their livers were removed for vitamin A assay.

Results.--The results indicate that in short-term experiments, growth may not be a reliable criterion for evaluation of vitamin A availability. On the basis of retention of vitamin A, gelatin-coated preparations were superior to preparations in which the vitamin was coated with wax or fat or was adsorbed to vegetable protein. Feeding oils and dehydrated cereal grass were the poorest sources of vitamin A. Stability tests showed some deterioration of the vitamin in all preparations, and although definite conclusions were difficult to draw, the superiority of gelatin preparations was indicated.

6.54 SWEDISH FISH FLOUR PLANT

Anonymous
Food Manufacture 34, 269 (June 1, 1959)

The first full-scale commercial plant for the production of edible fish flour is being built in Sweden and will come into operation this year. This development is said to mark a significant step forward in man's effort to produce a cheap and plentiful supply of animal protein.

In the course of developing the flour the Swedish concern, said to be the largest pharmaceutical manufacturing company in Sweden, has frequently consulted the Food and Agriculture Organization concerning quality standards, laboratory tests, consumer acceptability, price and other factors. Now that the product is coming into commercial production the company has asked FAO to co-operate in carrying out acceptability tests in some of the underdeveloped countries.

"We have agreed to do this, and the tests will be carried out by our Nutrition Division under the supervision of Dr. A. G. Van Veen, Chief of the Food Processing and Preparation Branch," stated Dr. Rudolf Kreuzer, Chief, Fish Processing Section, Fisheries Division, FAO.

The problem so far has been to produce an odorless and tasteless flour which, at the same time, retained its animal protein with a high biological value.

The Swedish concern that is building the flour factory claims to have perfected a method for producing such a flour containing 85 percent animal protein, which compares with about 15 percent protein content of fish and meat in fresh state. This is one of the highest concentrated protein substances yet produced by man and may mark a major victory in the battle to supply the mass of people in the world with sufficient animal protein in their diet.

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7.51 FURTHER IMPROVEMENT OF AN APPARATUS FOR THE ELECTROPHORESIS OF PROTEINS

Troitskii, G. V. and Kobozev, G. V. (Crimean Medical Institute, Simferopol, U. S. S. R.)
Biochemistry (U. S. S. R.) 23, 823-831 (November-December 1958)

In the type of microapparatus that now exists for optical electrophoresis, a glass cuvette is used; its volume is one-fifth to one-tenth that of the macromodels. The smaller volume of the microcuvette is achieved by decreasing either the height--86 millimeters (mm.) to 30 mm.--or the thickness of the layer of protein solution--25 mm. to 5 mm. The gap in the glass cuvette cannot be less than 2 mm. because the surface of the glass, which contains the ionogenic group, carries a charge so that in a glass cuvette with a small opening, there is strong endosmosis (electro-osmosis), and the endosmosis overcomes the electrophoretic curve.

The impossibility of decreasing the opening of the glass cuvette reduces the possibility of using frontal electrophoresis in the microelectrophoretic apparatus and makes it important to use a more sensitive optical device because the ordinary optical method based on the shadow principle of Foucall-Tepler is not sensitive enough for work with a microcuvette.

The cuvette for electrophoresis should be constructed of a material that has a small zeta-potential when in contact with water and that permits decreasing the opening of the cuvette without danger of endosmosis. Plexiglas is such a material, as was shown by experiments that demonstrated that when glass in the cuvette was replaced by plexiglas, the effects of endosmosis were reduced sharply and the cuvette opening could be reduced to 0.4 to 0.8 mm.--a three- to fivefold reduction. It is possible, therefore, to construct a microcuvette with the same volume used in microelectrophoresis, but with a thicker layer of protein (25 mm.). Since the sensitivity in recording the refraction

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ABSTRACTER: Kathryn L. Osterhaug

7.593 TECHNICAL NOTE NO. 54 - DICARBONYL COMPOUNDS AS COMPONENTS OF FISH ODOR

Mangan, George F., Jr. (U. S. Bureau of Commercial Fisheries, East Boston, Massachusetts)
Commercial Fisheries Review 21, 21-23 (July 1959)

Dicarbonyl compounds are important contributors to the flavor and odor of foodstuffs. Van Niel and coworkers (1929) have reported that diacetyl is partially responsible for the flavor and odor of butter and bread. Keeney (1957) reported the isolation of unknown α,β-dicarbonyl compounds from heated milk, and Underwood and associates (1956) reported the isolation of a number of α-dicarbonyl compounds from maple syrup. Lundberg (1957) and Privett and associates (1958) reported that the odor and flavor components of oxidized fish oils consist largely of unsaturated carbonyl and dicarbonyl compounds. Sinnhuber and Yu (1958) have suggested that malonaldehyde is the carbonyl compound active in the thiobarbituric acid (TBA) test for oxidative rancidity in fishery products. Patton and Kurtz (1951) concluded that malonaldehyde was the compound responsible for the red color developed with TBA reagent in oxidized milk fat.

This article reports on the preparation of derivatives of dicarbonyl compounds from the neutral volatile distillate of haddock fillets.

The neutral volatile distillate was obtained from fresh and fresh-frozen skinned haddock fillets by distilling a 1,500-gram sample of finely chopped fillet at room temperature under a vacuum of less than 1 micron (mercury) pressure. The volatile distillate was collected by condensation in a receiver immersed in liquid nitrogen. A 2,4-dinitrophenylhydrazine solution was added to the distillate, and a precipitate was allowed to form for 24 hours at room temperature. The precipitate was centrifuged, washed with 30-percent perchloric acid and distilled water, and then dried.

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ABSTRACTER: Kathryn L. Osterhaug

7.74 INTEGRATION OF ORGANIZED FOOD TECHNOLOGY INTO A SYSTEM FOR MAINE SARDINE PRODUCTION CONTROL

Clark, Berton S. (Maine Sardine Council Research and Quality Control Laboratory, Bangor, Maine)
Food Technology 13, 289-293 (June 1959)

Introduction.--In recent years, the Maine sardine industry has been very concerned because the volume of sales has not kept pace with the growth of population in the United States. Evidence indicated that improved sales would depend on the ability of the industry to make the product more attractive to the ultimate consumer. A research and quality-control program was designed to promote the sale of Maine sardines. Legislative action established the Maine Sardine Council as a State agency and provided a per-case tax on all canners to finance the project.

Research phase.--Early in 1954, action was taken to develop basic information concerning the technology of production operations and to devise a grading procedure to measure the quality of the product. In December of 1954, a Research Director was employed, who set up an organization to grade the entire 1955 pack for quality on a voluntary basis. Packers representing about 85 percent of the volume participated. This project focused attention on manufacturing operations that needed improvement and disclosed technical problems requiring research study. The rules for grading recognized three acceptable levels of quality: Fancy, Extra Standard, and Standard. Quality below Standard was classified as "No Grade."

Extensive experimental work produced evidence that loss of quality is associated with chemical changes in the flesh, probably stimulated by action of enzymes. Trichloroacetic acid-soluble nitrogen is produced by this reaction and provides a means of measuring its magnitude. The trichloroacetic acid-soluble nitrogen, being soluble in salt solutions, migrates from the fish to the brine, carrying

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ABSTRACTER: June H. Olden

SWEDISH FISH FLOUR PLANT

ELECTROPHORESIS OF PROTEINS

COMPONENTS OF FISH ODOR

SARDINE PRODUCTION CONTROL

7.51

gradient in the plexiglas cuvettes is the same as in the macrocuvettes, an ordinary optical recording device can be used.

Plexiglas cuvettes with cross section in the U-tubes of 3x25 mm., 1.5x25 mm., 0.8x25 mm., 0.4x25 mm., and 0.2x25 mm. were built and studied. The most suitable cuvettes for microelectrophoresis were those with openings of 0.4 mm. and a total volume of 0.42 cc. and openings of 0.8 mm. and a volume of 1 cc.

Parallel studies of the same serum in macro- and microcuvettes have been found to show satisfactory reproducibility in the relative percent of protein fractions and the electrophoretic mobility. See table (below).

Comparative percent content of protein fractions in the same serum and their mobility in the macro- and microapparatus

Type of electrophoretic apparatus	Content of different proteins, in percent of total amount				Mobility of different fractions, in 10^{-5} cm^2 v^{-1} sec^{-1}			
	Albumin	Globulins			Albumin	Globulins		
		α	β	γ		α	β	γ
Macroapparatus	39.7	9.2	8.1	43.0	7.5	5.7	3.8	1.5
Microapparatus	38.4	8.1	9.5	44.0	7.7	6.0	3.9	1.4

6.54

The flour is produced in a closed-circuit plant, fresh fish being fed into the plant at one end and the flour being delivered at the other end. Any type of fish can be used, from sharks to sprats. The vast quantities of trash fish which are now delivered to the fish-meal plants and are chiefly used to provide meal for chickens, which, in turn, provide eggs and meat for mankind, will be equally suitable for the production of fish flour.

7.74

a small quantity of insoluble nitrogen with it. Thus, the total nitrogen content of the storage brine is a measure of loss of protein from the fish during brine storage. Experiments showed (1) that escape of protein nitrogen to the brine can be held at a minimum by using brine-storage temperature ranges below 45° F. and (2) that the rate of loss is more than doubled at a storage temperature of 50° F. and is quadrupled at 70°. A study of protein losses indicated that to maintain maximum levels of quality, (1) the brine-storage time must be reduced to a minimum, (2) in-plant refrigeration must be adequate to assure that all of the fish in the tanks are cooled to 45° F. or lower, and (3) adequate refrigeration must be provided on the carrier boats.

Quality-grading phase.--The quality-grading phase of the program was maintained on a voluntary basis during the 1955, 1956, and 1957 seasons, and numerous improvements in quality were made.

Rules for grading, together with quality-level specificiations for quarter oil sardines, were promulgated and became part of the law; that is, about 85 percent of the 1958 pack became subject to mandatory grading under the law. Five grade levels were defined: Fancy, Extra Standard, Standard, Sub Standard, and No Grade. Lots classified Sub Standard must be labeled in accordance with State and Federal requirements, and "No Grade" lots cannot be sold as sardines. This provides a significant penalty for poor quality.

The number of samples not meeting the minimum acceptable-quality level markedly decreased from 1955 to 1958. About 85 percent of the 1958 pack had a quality rating above the standard-quality level. There is a continuous endeavor to achieve maximum quality and to develop new formulations to please the appetite.

Commercial benefits from this program have been recognized by the industry, and its Advisory Committee has recommended that the quarter mustard and three-quarter oil packs be placed on the mandatory grading list. Thus, over 99 percent of the Maine sardine pack of 1959 is officially being graded for quality.

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Color reaction in sodium ethylate, solubility data, and infrared spectra indicated that the derivatives had been formed from dicarbonyl and α-hydroxy carbon compounds of four or less carbon atoms. The carbonyl compounds may prove to be important components of the flavors and odors in fishery products, and a test for these compounds may serve as objective quality indices in fishery products.

7.81 DETERMINATION OF TRIMETHYLAMINE OXIDE IN FISH MUSCLE

Bystedt, J.; Swenne, L.; and Aas, H. Q. (Svenska Institute for Konserveringsforsking, Goteborg 5, Sweden)
Journal of the Science of Food and Agriculture 10, 301-304 (June 1959)

Introduction.--The marine fish examined contained trimethylamine oxide (TMAO) ranging from a few milligrams (mg.) to approximately 100 mg. of TMAO-nitrogen per 100 grams (g.) of fish muscle. This range of values was dependent upon species and environment and in some instances varied with the season and with the age of the fish. With few exceptions TMAO is also found in small concentrations in fresh-water fish. In the handling of fish, TMAO is of interest chiefly because it can be reduced by bacterial enzymes to trimethylamine (TMA). This type of reduction seems to take place only in the muscle of dead fish. Normally, TMA production runs parallel to spoilage, and the content of TMA is widely used as an index of spoilage for fresh fish.

Methods.--All methods described for the determination of TMAO include a preliminary reduction to the amine, which can be accurately estimated by the micro-diffusion methods of Conway and Byrne (1933) or Beatty and Gibbons (1937) or by the colorimetric method of Dyer (1945). Complete reduction, especially at low concentrations, is difficult to attain.

Purpose.--The present investigation was made to find an accurate method for the colorimetric determination of TMAO in extracts of fish prepared with 5-percent trichloroacetic acid as in Dyer's method (1945).

Titanous chloride method.--Of the reducing agents tried, titanous chloride appeared to be the most suitable for reducing TMAO to TMA. This reagent is used in neutral or in slightly acid solutions.

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 ABSTRACTER: Martin Heerdt

8.0 PROXIMATE COMPOSITION OF GULF OF MEXICO INDUSTRIAL FISH PART 3 - FALL STUDIES (1958)

Thompson, Mary H. (U. S. Bureau of Commercial Fisheries, Pascagoula, Mississippi)
Commercial Fisheries Review 21, 16-20 (July 1959)

Studies on the proximate composition of Gulf of Mexico industrial fish that were started during the winter of 1958 have been continued to include the fall months. The purpose of the project was to provide more complete information to the members of industry on the protein, oil, ash, and moisture content of 17 species of industrial fish found in the Gulf area.

Observations that were made during the period from September through November demonstrate that the moisture and oil content of the fish vary with the season.

All of the samples used in this study were collected by laboratory personnel from boats landing in the Pascagoula area. The samples were in excellent condition upon their arrival at the laboratory and were immediately frozen in plastic bags and stored at -20° F. until analyzed.

The results of the present analyses are given in table 4 (see over).

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 ABSTRACTER: Kathryn L. Osterhaug

7.89 FLAVOR AND ODOR OF FISH - PROGRESS REPORT

Mangan, George F., Jr. (U. S. Bureau of Commercial Fisheries, East Boston, Massachusetts)
Commercial Fisheries Review 21, 21-26 (June 1959)

Since the odor of fishery products is often used as a subjective method of assessing quality, a more precise knowledge of the odor components might lead to the development of objective methods of assessing quality. Positive identification of flavor and odor components in fish might further be utilized to study such questions as species identification, changes that occur in fish during freezing and storage, the composition of off-odors, irradiation odors, and flavor loss.

The experimental work on this project is being performed at the Quartermaster Research and Engineering Laboratories, Natick, Massachusetts. The general methods of investigating an unknown odor are diagrammed in figure 1 (see over). These methods have proven highly successful in defining the chemical components in the odors of onions, irradiated beef, and a variety of vegetable products.

The approach used so far in this study has been of a qualitative nature only. Considerable work has been devoted to developing and testing methods to enable future work to be of a quantitative nature. Present results indicate that "fish odor" is a complex mixture of organic compounds that occur in minute quantities in large amounts of water.

See illustration, over.

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 ABSTRACTER: Kathryn L. Osterhaug

8.51 THE FREE AMINO-ACIDS OF FISH II. FRESH SKELETAL MUSCLE FROM LEMON SOLE (PLEURONECTES MICROCEPHALUS)

Jones, N. R. (Torry Research Station, Aberdeen, Scotland)
Journal of the Science of Food and Agriculture 10, 282-286 (May 1959)

Introduction.--Quantitative data on the free amino acids in the muscle of a number of species of fish have become available in recent years. These data indicate that the free amino acids, together with the other nitrogenous extractives and volatiles of the tissue, are important in determining flavor. By combination with free sugars and by other reactions, the free amino acids also have been shown to be primary agents in the discoloration of flesh during dehydration, dry salting, and canning. Shewan has reported the separation of amino acids by a nonquantitative ion-exchange procedure from a partly autolyzed sample, but the literature contains no references to analyses of fresh material.

Purpose.--The present paper reports analytical data on the free amino acids of muscle from lemon sole trawled during the period April 1953 to October 1956. The sole were landed alive and killed immediately before analysis because earlier work had indicated that the free amino acid fraction was susceptible to rapid autolysis after death.

Experimental.--Lemon sole were trawled off the coast near Aberdeen, Scotland, landed alive, maintained for 6 to 24 hours in aerated sea water, killed by a blow on the head, and immediately skinned and filleted. Ten grams of muscle was removed from the anterio-dorsal part of the fillet and homogenized into absolute ethanol to give an 80 percent volume-for-volume (v/v) ethanolic extract with muscle water. The extract was centrifuged, and the residue was re-extracted three times with 80 percent v/v ethanol to give a final extract volume of 250 milliliters (ml.). Seventy-five ml. of chloroform was added to 25-ml. aliquots of the ethanolic extract, and the resulting

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 ABSTRACTER: Martin Heerdt

ASSAY FOR TRIMETHYLAMINE OXIDE

ODOR COMPONENTS OF FISH

INDUSTRIAL FISH COMPOSITION

AMINO ACIDS OF LEMON SOLE

7.89

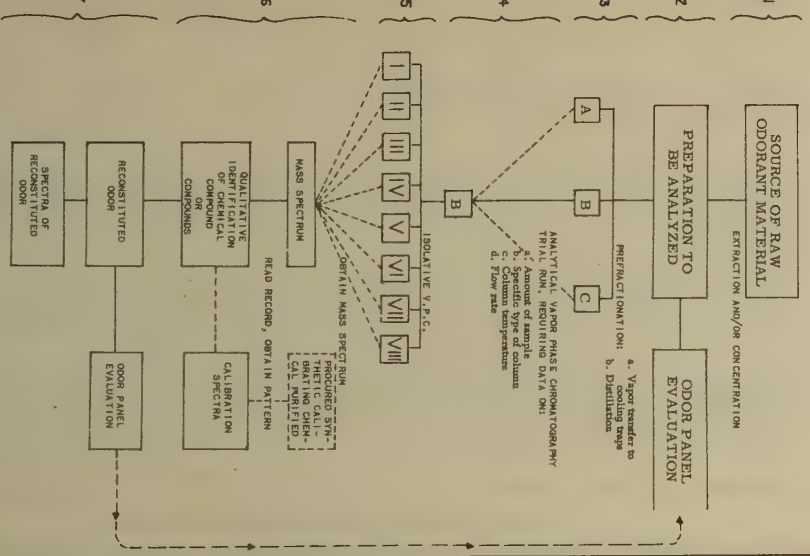

Figure. 1 - Scheme for investigation of an unknown odor.

7.81

Standard solutions and fish extracts. -- Trimethylamine oxide hydrochloride of 99.9 percent purity by Kjeldahl analysis was dissolved in a 5-percent solution of trichloroacetic acid, and four standard solutions containing 0.00125, 0.0050, 0.0100, and 0.0250 mg. TMA-nitrogen per milliliter (ml.), respectively, were prepared. Fish muscle extracts containing 5-percent trichloroacetic acid were prepared according to the method of Dyer (1945). In these extracts, 0.0005 mg. of TMAO-nitrogen per ml. corresponds to 1 mg. of TMAO-nitrogen per 100 g. of fish muscle.

Analytical procedure. --Transfer 20 ml. of muscle extract and 0.5 ml. of 10-percent $TiCl_3$ to a 100-ml. volumetric flask, and hold for 2 hours. Add a few drops of saturated KNO_3 solution to react with the excess of $TiCl_3$. The pink color should disappear after 5 to 10 minutes. Dilute the decolorized solution to 100 ml. with 5-percent trichloroacetic acid, and estimate TMA colorimetrically as picrate according to the method of Dyer (1945). For very small amounts of TMAO, the decolorized solution is diluted to 25 ml. Prepare a calibration curve for TMA using TMA solutions containing 5-percent trichloroacetic acid, not 1-percent hydrochloric acid as prescribed by Dyer.

Results. --Data obtained from the reduction of standard solutions of TMAO with titanous chloride were subjected to statistical analysis of variance. Data obtained from the reduction of TMAO in fish extracts are summarized below.

Reduction of TMAO in fish extracts with $TiCl_3$ (averages of duplicate analyses on 10 samples)

TMAO-nitrogen				Standard deviation, as % of 'found', due to	
Added, mg.	Calculated, mg.	Found		Analysis	Sampling variation
		mg.	% of calc.		
0	--	0.3075	--	0.36	1.20
0.0500	0.3575	0.3545	99.2	0.64	--
0.1000	0.4075	0.4000	98.2	0.52	1.56
0.2500	0.5575	0.5550	99.6	0.45	0.71

8.51

emulsion was allowed to separate. A 4-ml. aliquot of the upper aqueous layer, which contained the amino acids, was freeze-dried and stored at 0° C. over phosphorus pentoxide to prevent a Maillard reaction from taking place with any sugar present. Analyses showed that ribose was absent from extracts of fresh sole muscle, so it was possible to chromatograph these extracts without further treatment to remove the Maillard-reactive sugar. The glucose that was present was nonreactive.

Results. --Of the free amino acids reported in the flesh of slightly autolyzed sole, α-alanine, glycine, glutamic acid, leucine, and lysine also were present in fresh muscle in quantities that could be estimated chromatographically. β-alanine was identified and measured in fresh cod muscle, as was taurine, which occurs in high concentration but which was not detectable by Shewan's ion-exchange procedure. The amounts of the individual free amino acids varied considerably with the time of the year. Values for glycine, glutamic acid, and taurine showed additional marked, seasonal variation. α-alanine, which showed no characteristic seasonal variation, ranged from 6 to 80 mg. per 100 g. of muscle. β-alanine was not always detectable in the tissue, but values as high as 22 mg. per 100 g. of tissue were recorded.

Glutamic acid values, which showed a marked seasonal variation, were highest during February and March and lowest during September and October. The highest recorded value for glutamic acid was 34 mg. per 100 g., and the lowest was 2 mg. per 100 g. Glycine varied in a similar, seasonal manner, with the maxima and minima being found at the same period of the year. Glycine concentrations ranged widely from 7 to 184 mg. per 100 g. of tissue. Leucine, like β-alanine, was not always detectable in the muscle. A maximum value of 7.9 mg. per 100 g. was recorded with no significant seasonal variation. Lysine also was absent frequently, but isolated values of as high as 26.4 and 47.8 mg. per 100 g. of tissue have been found.

Taurine, which was the major constituent of the free amino acid fraction, varied seasonally but not in the same manner as did glycine and glutamic acid. Taurine values, which were maximal during July to September and minimal during March and April, ranged from 202 to 498 mg. per 100 g. of tissue.

8.0

Table 4.--Proximate composition of limited samples[1] of industrial fish commonly obtained in the fall

Common name	Total number of fish analyzed	Protein		Oil		Ash		Moisture
		Range	Average	Range	Average	Range	Average	Range
		Percent	Percent	Percent	Percent	Percent	Percent	Percent
Anchovies	40	16.1-16.4	16.2	2.7-3.8	3.1	3.53-3.91	3.69	76.6-78.2
Bumper	8	18.1-19.2	18.6	4.7-5.4	5.1	3.11-5.13	3.91	70.2-73.4
Butterfish	8	16.1-16.9	16.6	1.5-3.1	2.6	1.92-2.85	2.37	76.9-80.6
Croaker	8	16.0-17.1	16.5	2.9-4.2	3.6	2.73-5.29	3.96	74.3-76.9
Croaker, banded	8	17.5-18.1	17.8	1.5-2.8	2.3	3.08-4.54	4.03	74.2-76.9
Grunt	8	16.0-17.1	16.6	7.1-11.8	9.9	2.99-4.48	3.71	68.1-72.5
Hardheads	11	15.4-16.0	15.7	7.9-9.7	8.8	4.23-6.31	5.34	69.1-70.8
Harvestfish[2]	7	18.0-18.5	18.3	2.9-4.7	3.6	2.02-2.94	2.60	74.1-75.9
Menhaden	8	14.7-14.9	14.8	15.1-16.8	16.0	2.79-3.90	3.38	63.9-66.7
Razorbellies	20	18.1-18.8	18.5	6.2-7.3	6.7	4.80-6.92	5.82	68.5-70.2
Round herring	11	18.3-19.0	18.7	1.1-4.7	3.0	3.47-3.82	3.72	73.7-77.1
Scad	24	16.9-17.5	17.3	2.0-2.5	2.2	3.03-4.28	3.55	76.5-77.6
Silver eels, (Cutlassfish)	4	17.5-18.0	17.8	1.9-3.3	2.7	3.09-4.04	3.51	75.5-77.8
Silver perch, Method A	16	15.9-16.9	16.4	1.5-2.5	2.2	3.15-5.07	4.48	75.6-79.1
Spots	12	16.7-17.1	16.9	2.4-4.1	3.5	3.34-4.31	4.00	75.7-77.3
Threadfin[3]	16	17.3-18.3	17.8	5.1-8.5	6.8	3.44-4.12	3.73	69.9-72.9
White trout, Method A	8	17.4-18.2	17.7	4.6-7.4	6.2	2.41-3.89	2.93	72.2-74.9
White trout, Method B	10	17.5-17.9	17.7	5.9-6.1	6.0	3.30-3.91	3.64	72.7-73.1

1/ The sampling was done by method A, as described under "Proximate Composition." For each species, the data are representative only of the fish of that species landed on one trip by one vessel.
2/ Figures are from 3 samples, instead of the usual 4.
3/ Figures are from 5 samples, instead of the usual 4.
Note: Data on the physical measurements of these fish are found in Table 3.

0.321 FLOW BIREFRINGENCE STUDIES OF CRAYFISH MYOSINS

Maruyama, K. (University of Tokyo, Meguro, Tokyo, Japan)
Archives of Biochemistry and Biophysics 82, 422-430 (June 1959)

On addition of adenosinetriphosphate, flow birefringence properties of crayfish myosin B diminished considerably. Myosin A (pure myosin separated from myosin B) from crayfish tail muscle was homogeneous in molecular length, which was calculated to be 1600 Angstrom units. Actin could not be extracted from the acetone-treated crayfish muscle; tropomyosin was obtained instead.

0.321 EXTRACTABILITY OF FISH MUSCLE PROTEINS

Shimizu, Yutaka and Shimizu, Wataru (Kyoto Univ., Maizuru)
Mem. Coll. Agr., Kyoto Univ. Fisheries Ser., Spec. No. 68-76 (1958)
Chemical Abstracts 53, 12363e (July 10, 1959)

Salt solution-soluble proteins of striped bass muscle were extracted. Maximum extraction was reached in 2 to 3 hours; this was due to gradual extraction of actomyosin. Water-soluble proteins were readily extracted. A marked thixotrophy accompanied with intense turbidity occurred in extracting with 0.6M NaCl but not with 1.5M NaCl.

0.38 LINGCOD MUSCLE NUCLEASE

Tomlinson, Neil
Canadian Journal of Biochemistry and Physiology 37, 945-952 (August 1959)

A nuclease from the muscle of lingcod (Ophiodon elongatus) has been purified by chromatography on diethylaminoethyl cellulose in the free-base form by stepwise elution with increasing concentrations of tris(hydroxymethyl)aminomethane HCl, pH 7.0. The nuclease has been shown to hydrolyze ribonucleic acid, adenosine 3'-benzyl phosphate, thymidine 3'-p-nitrophenyl phosphate, and thymidine 5'-p-nitrophenyl phosphate. It did not hydrolyze adenosine 2'- or 5'-benzyl phosphate or certain nucleoside cyclic phosphates. The enzyme was inhibited by monoiodoacetate but not by heparin.

0.38 LINGCOD MUSCLE PHOSPHORIBOISOMERASE AND RIBULOSE 5'-PHOSPHATE 3'-EPIMERASE

Tarr, H. L. A. (Fisheries Research Board of Canada, Technological Station, Vancouver, B. C.)
Canadian Journal of Biochemistry and Physiology 37, 961-973 (August 1959)

Comparatively pure phosphoriboisomerase and ribulose 5'-phosphate 3'-epimerase enzyme preparations were obtained from lingcod muscle by a simple procedure involving water extraction, saturation of the extract with ammonium sulphate, dialysis, brief heating to 55° C., lyophilization of the solution, and the final separation by ion exchange chromatography on diethylaminoethyl cellulose columns. Both enzymes have broad pH optima above pH 7.0, but they are rapidly inactivated below this value. The ketopentulose phosphate resulting from the action of phosphoriboisomerase on D-ribose 5-phosphate was isolated and identified as D-ribulose 5-phosphate.

2.01 OBJECTIVE AND SUBJECTIVE ASSESSMENTS OF FISH QUALITY

Shewan, J. M. and Liston, J.
Bulletin International Refrigeration, Supplement Annex 1, pp. 137-147 (1956)

(Abstract of this article appears under 7.80 page 9 - October 1959)

2.01 STUDIES ON THE INTERNAL SPOILAGE OF FISH-JELLY PRODUCTS--III. MEASUREMENT OF OXIDATION-REDUCTION POTENTIAL IN FISH-JELLY PRODUCTS

Yokoseki, Motonobu
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 9, 765-769 (1959) (English abstract, figures, and tables)

Oxidation-reduction potential was determined as an index of the anaerobic condition in various kinds of fish-jelly products, including fish sausage.

2.01 GREEN DISCOLORATION IN MEAT

Suri, B. B.
Fleischwirtschaft 11, 121-2 (1959)
Chemical Abstracts 53, 11695g (June 25, 1959)

Green discolorations are caused by oxidizing and sulfide-forming bacteria that are effective even after death through the enzyme activity of their cells.

2.114 ON THE FORCES ACTING ON THE RUDDER

Inaba, Yasuhito
Bulletin of the Faculty of Fisheries Hokkaido University 9, No. 1, 37-42 (May 1958) (English abstract and figures)

From the investigation of marine accidents caused by the steering gear, it was ascertained that the greater part were caused by breaking of the steering chain and rudderhead due to the forces acting on the rudder.

2.114 REFRIGERATED CROAKER BOAT BRINGS IN TOP-QUALITY CATCH

Anonymous
Fish Boat 4, 36 (July 1959)

Pioneer Gulf skipper installs a system specially designed for industrial fishing. It is practical and easy to maintain.

GLOSSARY OF COMMON AND SCIENTIFIC NAMES OF FISH AND SHELLFISH*

Common name	Other common names	Scientific name
Alewife	Branch herring, big-eyed herring, river herring,	Pomolobus pseudoharengus
	Blueback, glut herring, shad herring	Pomolobus aestivalis
Anchovy		Engraulis mordax
Cod	Codfish	Gadus morhua (Atlantic)
		Gadus macrocephalus (Pacific)
Flounder:		
Gray sole		Glyptocephalus cynoglossus
Lemon sole		Pseudopleuronectes dignabilis
Yellowtail	Dab	Limanda ferruginea
Dab	Sea dab	Hippoglossoides platessoides
Blackback	Winter flounder	Pseudopleuronectes americanus
Fluke	Summer flounder, gulf flounder, flounder	Paralichthys species
'Sole'		Pleuronectidae and Bothidae species
'California halibut'		Paralichthys californicus
Haddock		Melanogrammus aeglefinus
Halibut		Hippoglossus hippoglossus (Atlantic)
		Hippoglossus stenolepis (Pacific)
Herring:		
Lake	Herring	Leucichthys artedi (Great Lakes, except Erie)
Round		Etrumeus sadina
Sea		Clupea harengus (Atlantic)
		Clupea pallasii (Pacific)
Thread		Opisthonema oglinum
Jack mackerel	Horse mackerel	Trachurus symmetricus
Lingcod	Cultus cod, blue cod, buffalo cod, ling	Ophiodon elongatus
Mackerel		Scomber scombrus (Atlantic)
		Pneumatophorus diego (Pacific)
Crab:		
Blue		
Hard	Hard-shelled crab	Callinectes sapidus
Soft and peelers	Soft-shell crab	Callinectes sapidus
Dungeness		Cancer magister
King	Alaska king crab	Paralithodes camtschatica
Rock		Cancer irroratus (New England)
		Cancer species (California)
Stone		Menippi mercenaria
Lobster:		
Northern		Homarus americanus (Atlantic)
Spiny	Sea crawfish, rock lobster	Panulirus argus (Atlantic)
		Panulirus interruptus (Pacific)
Shrimp	Prawn	Penaeus setiferus (South)
		Penaeus duorarum (Atlantic)
		Penaeus aztecus and
		Xiphopeneus kroyeri Gulf)
		Pandalus species (Atlantic and Pacific)
		Pandalopsis species (Pacific)
		Crago species (Pacific)

Common name	Other common names	Scientific name
Menhaden	Mossbunker, pogy, fatback	Brevoortia species
Mullet	Jumping mullet, striped mullet, silver mullet	Mugil species
Ocean perch:		
Atlantic	Rosefish, redfish, red perch	Sebastes marinus
Pacific		Sebastodes alutus
Pilchard	Sardine	Sardinops caerulea
Pollock	Boston bluefish	Pollachius virens
Rockfish	Rock cod, snapper	Sebastodes species (Pacific)
Sablefish	Black cod	Anoplopoma fimbria
Salmon:		
Atlantic		Salmo salar (Atlantic)
Pacific:		
Chinook or king	Tyee, spring	Oncorhynchus tshawytscha
Chum or keta	Fall, dog	Oncorhynchus keta
Pink	Humpback	Oncorhynchus gorbuscha
Red or sockeye	Blueback	Oncorhynchus nerka
Silver or coho		Oncorhynchus kisutch
Spanish mackerel	Mackerel	Scomberomorus maculatus
Tuna and tunalike fishes:		
Albacore	Longfin tuna	Germo alalunga
	---	Thunnus saliens
Bluefin	Horse mackerel	Thunnus thynnus
	---	Thunnus secundodorsalis
Bonito		Sarda sarda (Atlantic)
		Sarda chiliensis (Pacific)
Little	Bonito, albacore, false albacore	Euthynnus alletteratus
Skipjack	Striped tuna	Katsuwonus pelamis
Yellowfin		Neothunnus macropterus
Whiting	Silver hake	Merluccius bilinearis
Clam:		
Cockle		Cardium corbis (Pacific)
Coquina	Pompano shells	Donax variabilis
	Butter	Saxidomus nuttali (Pacific)
Hard	Little neck	Paphia staminea (Pacific)
	Round clam, cherrystone, quahog, little neck	Venus mercenaria (Atlantic)
		Venus mortoni (Florida)
Ocean quahog		Cyprina islandica
Pismo		Tivela stultorum (Pacific)
Razor		Ensis species (Atlantic)
		Siliqua patula (Pacific)
Soft	Soft-shell clam, sand clam, nannynose, maninose	Mya arenaria
Surf	Skimmer	Spisula solidissima
Oyster:		
Eastern	Cove	Crassostrea virginica
Pacific (introduced)	Japanese	Crassostrea gigas
Western	Olympia, native	Ostrea lurida
Scallop:		
Bay		Pecten irradians (Atlantic)
		Pecten aequisulcatus (Pacific)
Sea		Pecten magellanicus

* Taken from Fishery Statistics of the United States 1955. Each species listed was caught in excess of 10,000,000 pounds in 1955.

2.12 CHAETOGNATHS AND PTEROPODS AS BIOLOGICAL INDICATORS IN THE NORTH PACIFIC

Hida, Thomas S. (Pacific Oceanic Fishery Investigations, Honolulu, T. H.)
Special Scientific Report: Fisheries No. 215, 13 pp. (June 1957) (U. S. Department of the Interior, Fish and Wildlife Service, Washington 25, D. C.)

In connection with investigations of potential albacore tuna fishing grounds, the distribution of chaetognaths and pteropods in the North Pacific was examined to determine whether any representatives of these groups could serve as biological indicators. Indications are that surface albacore are not confined to a particular type of water as defined by the faunal zones and the temperature-salinity characteristics.

2.12 (Cross Reference: 1.0116)

SHRIMP EXPLORATIONS OFF SOUTHEASTERN COAST OF THE UNITED STATES (1956-1958)

Bullis, Harvey R., Jr. and Rathjen, Warren F. (U. S. Bureau of Commercial Fisheries, Pasacagoula, Mississippi)
Commercial Fisheries Review 21, 1-20 (June 1959)

New deep-water royal-red shrimp grounds were discovered off the Florida east coast during the 1956-1958 explorations with vessels chartered by the U. S. Bureau of Commercial Fisheries. The trawling investigations were conducted from Cape Hatteras, North Carolina, to Dry Tortugas, Florida. Commercial catches of royal-red shrimp have ranged as high as 800 pounds (heads off) per fishing day. These shrimp, of a size desired by industry, have been found most consistently in depths of 180 to 220 fathoms between St. Augustine and Cape Canaveral, Florida. Possible commercial fishery resources of rock shrimp, scallops, and flounder also were located.

3.12 EXPERIMENTS ON THE IRRADIATION OF FISH WITH 4 MEV CATHODE RAYS ON COBALT GAMMA RAYS

Shewan, J. M. and Liston, J.
D.S.I.R. Food Investigation Memoir No. 1204 (1958)

(Abstract of this article appears under 3.19 page 5 - October 1959)

3.12 EFFECTIVENESS OF TETRACYCLINES TREATMENT ON QUALITY IMPROVEMENT OF PROCESSED FOODS I. EFFECT OF CHLORTETRACYCLINE (CTC) TREATMENT ON QUALITY OF SALT SARDINE AND SALT MACKEREL AND CHANGE IN CTC RESIDUE DURING SALTING

Tomiyama, Tetuo and Sugitani, Tohru
Bulletin of the Japanese Society of Scientific Fisheries 24, Nos. 6 and 7, 581-585 (1958) (English abstract and tables)

In brine salting of sardines, the addition of a 10-p.p.m. level of CTC to a 10-percent brine was capable of preventing the fish from spoiling for 2 days at 20° C. An excellent quality of salt sardine was obtained when the fish was dipped for 1 hour in a 20 p.p.m. CTC brine prior to dry salting. In both brine salting and dry salting, CTC treatment reduced the necessary amount of salt to one-half of the usual requirement. The decrease in CTC content of the brine as well as of the tissue occurred during the brine salting of mackerel. The CTC content of dry salted sardines after 4 days of storage at room temperature was only 0.03 to 0.17 p.p.m.

3.2382 (Cross Reference: 6.34)

PRODUCTION OF CALCIUM ALGINATE FILMS AND THEIR UTILIZATION IN THE FREEZING OF MEAT

Slepchenko, I. R.; Knizhnik, E. V.; and Piraeva, L. A.
Sbornik Stud. Rabot. Moskov. Tekhnol. Inst. Myasnoi i Moloch. Prom. 1956, No. 4, 39-46
Referat Zhur. Khim. 1958, Abst. No. 2995
Chemical Abstracts 53, 13440f (July 25, 1959)

Meat cuts (1 kg.) were immersed at 18° to 20° for several seconds in a 15-percent solution of sodium alginate. After excess solution had drained off, the samples were transferred for 3 to 5 minutes to a 3.5-percent solution of $CaCl_2$. In order to impart elasticity to the thus-formed calcium alginate film, the samples to be stored were immersed in a 10-percent solution of glycerol.

3.2382 STUDIES ON FISH SAUSAGE III. ON SOME PHYSICO-CHEMICAL PROPERTIES OF A FILM OF THE RYPHAN (RUBBER HYDROCHLORIDE) AND THE KREHALON (POLYVINYLIDEN CHLORIDE) USED AS THE CASINGS OF FISH SAUSAGE

Ueno, Saburo; Hasimoto, Toru; and Simidu, Wataru (Department of Fisheries, Kyoto University)
Bulletin of the Japanese Society of Scientific Fisheries 24, Nos. 6 and 7, 559-562 (1958) (English abstract, figures, and table)

If the films are heated in hot water, a great deal of chlorine ion is liberated from Ryphan, but not from Krehalon. The discoloration of nitroso-heme in cooked whale meat may be based upon oxidation. Krehalon, which is air proof, is preferable to Ryphan in the prevention of discoloration.

3.3344 STUDIES ON THE "BROWNING" OF CANNED CRAB MEAT (PARALITHODES CAMTSCHATICA TIL.) I. THE DIFFERENCE IN THE CHEMICAL COMPOSITION OF NORMAL AND BROWNED CANNED CRAB MEAT

Nagasawa, Yoshio (Faculty of Fisheries, Hokkaido University)
Bulletin of the Japanese Society of Scientific Fisheries 24, Nos. 6 and 7, 535-540 (1958) (In English)

II. Effect of chemical materials on the "browning" reaction. -- Ibid. No. 10, 816-820 (1959). When glutamic acid, phenylalanine, glycine, saccharose, rhamnose, and trimethylamine were added to the white meat, the meat showed little change in color, but when cystine, lactose, arabinose, glucose, galactose, formaldehyde, or ascorbic acid were added separately, the color became brown. The browning of the canned crab was prevented by the addition of 0.25 percent by weight of sodium bisulfite or 0.5 percent hydroxylamine. Browning of squid meat was prevented by the addition of 0.5 percent of hydroxylamine, but not by the addition of even as much as 1 percent of sodium bisulfite.

III. The "browning" of canned crab as dependent upon the time of leaving the raw crab without carapace but uncanned. -- Ibid. No. 11, 900-904 (1959). Crab meat was canned from crab held for various lengths of time in an uncooked state and from boiled crab meat held for 2 days. In materials left uncooked, volatile basic nitrogen increased, quality decreased, browning increased; total nitrogen, protein nitrogen, and amino nitrogen decreased slowly, and reducing sugar decreased rapidly. Canned crab made from boiled meat decreased gradually in quality, and the rate of browning advanced with the time that the meat was left uncanned.

CONVERSION UNITS

1 pound = 453.59 grams
1 ounce = 28.350 grams
1 inch = 2.5400 centimeters
1 gallon = 128 ounces
1 gallon = 231 cubic inches
1 quart = 0.9463 liters
1 ounce = 29.573 milliliters

CONVERSION OF TEMPERATURE SCALES

$F = 9/5\ C + 32$

$C = 5/9\ (F - 32)$

SPECIFIC HEAT AND HEAT OF FUSION

Average values of specific heat generally used for fishery products are 0.80 B.t.u. per pound per °F. above freezing and 0.40 B.t.u. per pound per °F. below freezing.

An average heat of fusion generally used for fishery products is 115 B.t.u. per pound. The heat of fusion of ice is 144 B.t.u. per pound.

DEFINITIONS

calorie	heat required to raise the temperature of 1 gram of water 1 degree Centigrade
British thermal unit	252 calories or the heat required to raise the temperature of 1 pound of water 1 degree Fahrenheit
ton of refrigeration	removal of heat at the rate of 12,000 B.t.u. per hour
atmospheric pressure, normal	a pressure at sea level of 14.696 pounds per square inch, absolute
sensible heat	heat added to the body when its temperature is changed
latent heat	heat absorbed or evolved during a change of state, with no change of temperature
heat of fusion	heat absorbed when a solid melts, with no change of temperature
heat of vaporization	heat absorbed when a liquid vaporizes, with no change of temperature
heat of reaction	heat evolved or absorbed during a chemical reaction
heat transmission	flow of heat by conduction, convection, or radiation, singly or in any combination
horsepower	work performed at the rate of 550 foot pounds per second
mechanical equivalent of 1 B.t.u. of heat	heat given off by a total expenditure of 778 foot pounds of energy

COMMON ABBREVIATIONS*

A.	Ångstrom unit(s)
a.c.	alternating current
alc.	alcohol, alcoholic
alk.	alkaline (not alkali)
amp.	ampere(s)
anhyd.	anhydrous
aq.	aqueous
at.	atomic (not atom)
at. wt.	atomic weight
Bé.	Baumé
biol.	biological
B.O.D.	biochemical oxygen demand
b.p.	boiling point
B.t.u.	British thermal unit(s)
cal.	calorie(s)
cc.	cubic centimeter(s)
cm.	centimeter(s)
d.	density (d_{13} specific gravity at 13° referred to water at 4°; d_{20}^{20}, at 20° referred to water at the same temperature)
d.c.	direct current
e.m.f.	electromotive force
Et	ethyl (Et_2O, ethyl ether)
e.v.	electron volt(s)
f.p.	freezing point
ft.	foot, feet
g.	gram(s)
γ	microgram(s)
hr.	hour
in.	inch(es)
kcal.	kilocalorie(s)
kg.	kilogram(s)
kv.	kilovolt(s)
kv.-amp.	kilovolt-ampere(s)
kw.	kilowatt(s)
kw.-hr.	kilowatt-hour
l.	liter(s)
lb.	pound(s)
m.	meter(s); also (followed by a figure denoting temperature) melts at, melting at
M.	molar (as applied to concn.)
ma.	milliampere(s)
Mc.	megacycle
mc.	millicurie
Me	methyl (MeOH, methanol)
meq.	milliequivalent
m.e.v.	million electron volts
mg.	milligram(s)
ml.	milliliter(s)
mm.	millimeter(s)
mγ	millimicrogram
mμ	millimicron(s)
mol.	molecule, molecular
mol. wt.	molecular weight
m.p.	melting point
μ	micron(s)
mv.	millivolt(s)
n	index of refraction (n_D^{20} for 20° and sodium light)
N	normal (as applied to concn.)
petr. ether	petroleum ether
p.p.m.	parts per million
ppt.	precipitate
pptd.	precipitated
pptg.	precipitating
pptn.	precipitation
qual.	qualitative (not qualitatively)
quant.	quantitative (not quantitatively)
r.p.m.	revolutions per minute
sol.	soluble
soln.	solution
sp. gr.	specific gravity
sp. heat	specific heat
sp. vol.	specific volume
sq. cm.	square centimeter(s)
U.S.P.	United States Pharmacopeia
v.	volt(s)
vol.	volume (not volatile)
w.	watt(s)
wt.	weight

* These abbreviations are used by Chemical Abstracts and, accordingly, have wide recognition.

4.91 EFFECT OF UNSATURATED ACIDS AND FISH OILS ON PLASMA AND TISSUE LIPIDES FROM HYPERCHOLESTEREMIC RATS

Peifer, James J. and Lundberg, W. O. (Hormel Institute, University of Minnesota, Austin)
Federation Proceedings 18, Part I, 300 (March 1959)

Rats were made hypercholesteremic by feeding a diet containing 10 percent tallow, 0.5 percent cholesterol, and 0.5 percent ox bile. Plasma levels of cholesterol were most rapidly and significantly reduced by substituting one-third of dietary tallow with tuna and menhaden oils and ethyl linolenate. Linoleate was less effective, whereas oleate and palmitate-supplemented groups remained hypercholesteremic. Changes in plasma cholesterol were not correlated with similar changes in liver lipides. Both phospholipide and cholesterol ester fatty acids from liver lipides were markedly influenced by the dietary fatty acid supplements.

4.91 A RAPID METHOD FOR THE STUDY OF THE EFFECT OF UNSATURATED FATTY ACIDS ON CHOLESTEROL METABOLISM IN RATS

Hauge, Jens G. and Nicolaysen, Ragnar (Univ., Oslo, Norway)
Acta Physiol. Scand. 45, 19-25 (1959)
Chemical Abstracts 53, 11557d (June 25, 1959)

A method is presented for simultaneous production of essential fatty acid deficiency and hypercholesteremia in young rats.

6.14 FLUCTUATIONS IN MOISTURE CONTENT OF FISH MEAL

Stander, G. H.
Annual Report, Fishing Industry Research Institute, April-December 1956, Cape Town, South Africa, 10, 23 (1957)

The influence of atmospheric temperature and humidity on the moisture content of bagged fish meal was studied. Despite large fluctuations in atmospheric temperature, the moisture content of samples representing all layers of the bags remained fairly constant. Inside surface moisture showed considerable fluctuation that clearly was related to atmospheric conditions.

6.14 TREATING PROTEIN MEAL OF MARINE ORIGIN

Marstrand, Anton J. S.
Brit. 810,689 (Mar. 18, 1959)
Chemical Abstracts 53, 12526a (July 10, 1959)

An apparatus is described for preheating protein meal of marine-animal origin so that, upon storage, the meal will not be subject to oxidative and condensation reactions. Hot moist air at 35° to 60° is passed through the meal in a bin. The hot air is supplied nonuniformly over the area at the bottom of the bin so that the meal is set in motion. In this manner, the aging of herring meal is controlled. Well-known oxidative changes concerned with the rancidification of fat and nonoxidative reactions between carbohydrates, proteins, and fatty acids occur but in a manner which prevents undesired changes and promotes desired changes.

6.55 ANIMAL FEED FROM HERRING WASTES

Jahn, Friedrich
Ger. (East) 11,819 (June 23, 1958)
Chemical Abstracts 53, 4610a (March 10, 1959)

Hydrogen is passed over herring waste in an autoclave at 1 to 1.5 atmospheres of pressure to avoid the formation of an emulsion. The press cake that remains after the extraction of oil and excess water is preserved and ensiled at 0.3 to 0.5 atmospheres of pressure. The product is used as a feedstuff for chickens and pigs, and it is said to be superior to fish meal because the vitamins are preserved.

6.55 FISH MEAL

Hull Cod Liver Oils Ltd. (Geo. E. Tunnicliffe and Matthew Weatherstone, inventors)
Ger. 952,680 (Nov. 22, 1956)
Chemical Abstracts 53, 9515f (May 25, 1959)

The fishes are crushed and treated at 71° C. with concentrated HCl. Addition of H_2O should be avoided as far as possible. The pH of the mixture should be 4.5 to 6.0, preferably 5.0 to 5.2.

7.42 INTERNAL STANDARDIZATION WITH LITHIUM: ITS USE IN FLAME PHOTOMETRY FOR BIOLOGICAL SPECIMENS

Bernstein, Ralph E. (Univ. Witwatersrand, Johannesburg)
S. African J. Med. Sci. 23, 103 (1958)
Chemical Abstracts 53, 6333a (April 10, 1959)

In flame analysis used to establish Na, K, Ca, Mg, Cu, and Fe in biological fluids and tissues, Li is added to all solutions atomized so that the unknown is determined from a ratio measurement of emissions. Comparison of various methods of external and internal standardization indicates that replicate determinations and recoveries have smaller errors by internal standardization, as compared with direct analysis in the same instrument for selected conditions. Li is a satisfactory internal standard for Na and, probably for K, within certain concentration limits and conditions of flame operations. It is less suited to Ca, Mg, and other estimations.

7.42 USE OF GLASS ELECTRODES FOR MEASURING SODIUM IN BIOLOGICAL SYSTEMS

Friedman, Sydney M.; Jamieson, James D.; Hinke, J. A. M.; and Friedman, Constance L. (Univ. of British Columbia, Vancouver, Can.)
Proc. Soc. Exptl. Biol. Med. 99, 727-30 (1958)
Chemical Abstracts 53, 7289e (April 25, 1959)

The construction and use of a sodium glass-to-silver electrode for biological use is described. The instrument is simple and particularly useful for continuous recording of small changes in sodium ion concentration, both in static and in flowing systems.

LIST OF PUBLICATIONS REGULARLY ABSTRACTED

Analyst
Analytical Chemistry
Archives of Biochemistry and Biophysics
ASHRAE Journal (formerly Refrigerating Engineering)
Biochemical Journal
Biochemistry (U.S.S.R.)
Bulletin of the Faculty of Fisheries, Hokkaido University
Bulletin of the Japanese Society of Scientific Fisheries
California Fish and Game
Canadian Fisherman
Canadian Journal of Biochemistry and Physiology
Canadian Journal of Chemical Engineering
Canadian Journal of Chemistry
Chemical Abstracts
Chemical and Engineering News
Chemical Engineering
Chemical Processing
Chemistry and Industry
Commercial Fisheries Review
Drug and Cosmestic Industry
Federation Proceedings
Feed Bag
Feedstuffs
Fish Boat
Fisheries Newsletter (Australia)
Fish. Res. Bd. Can., Prog. Repts. Atlantic Coast Stas.
Fish.Res. Bd. Can., Prog. Repts. Pacific Coast Stas.
Fishing Gazette
Food Engineering
Food Manufacture
Food Preservation Quarterly
Food Processing
Food Research
Food Technology
Frosted Food Field
Industrial and Engineering Chemistry
Industrial Refrigeration
Journal of Agricultural and Food Chemistry
Journal of Applied Chemistry
Journal of Biological Chemistry
Journal of Nutrition
Journal of the American Chemical Society
Journal of the American Dietetic Association
Journal of the American Oil Chemists' Society
Journal of the Association of Official Agricultural Chemists
Journal of the Fisheries Research Board of Canada
Journal of the Science of Food and Agriculture
Maine Coast Fisherman
Modern Packaging
Modern Refrigeration
National Fisherman
National Provisioner
Nature
Nutrition Reviews
Pacific Fisherman
Poultry Science
Progressive Fish-Culturist
Quick Frozen Foods
Report of the Food Investigation Board (Great Britain)
Science
Seafood Merchandising
Trade News (Fisheries Department, Canada)
Western Canner/Packer
Western Fisheries
World Fisheries Abstracts
World Fishing

Articles chosen for abstracting or inclusion as bibliographical references are those deemed of interest to the commercial fisheries and to fishery technological laboratories. Occasionally pertinent articles from sources other than the above-listed publications are included. Biological papers are generally omitted.

7.45 COLORIMETRIC MICRODETERMINATIONS OF CALCIUM IN BIOLOGICAL SPECIMENS

Bankoviskis, J.; Baumane, V.; and Ievins, A. (Inst. Chem. and Biol. Acad. Sci. Latv. S.S.R., Riga)
Biokhimiya 23, 845-8 (1958)
Chemical Abstracts 53, 5373h (March 25, 1959)

The calcium is precipitated as calcium molybdate, and the molybdenum is determined with the aid of 8-mercaptoquinoline. By this method 2 to 50 γ calcium in a sample can be determined with 5 percent error.

7.45 MICROMETHOD FOR THE ESTIMATION OF TOTAL SULFUR IN BIOLOGICAL MATERIALS

Lees, Marjorie B. and Folch, Jordi (McLean Hosp. Research Lab., Waverly, Mass.)
Biochim. et Biophys. Acta 31, 272-4 (1959)
Chemical Abstracts 53, 9343f (May 25, 1959)

Total sulfur in biological materials is estimated in samples containing as little as 50γ sulfur with an error of ± 2γ. Methionine-sulfur is estimated quantitatively. More accurate results are obtained when samples containing more than 0.5 percent sulfur are assayed. The sample is digested with aqua regia in a sealed tube, PO_4^{---} is removed as $MgNH_4PO_4$, SO_4^{--} is precipitated as a benzidine salt, and the benzidine sulfate is titrated with dilute alkali.

8.0 CHANGES IN CHEMICAL COMPOSITION DURING THE MATURATION OF RAINBOW TROUT EGGS

Suyama, Michizo
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 8, 656-659 (1958) (English abstract and table)

Water and nonprotein nitrogen contents tended to decrease, whereas protein nitrogen and ash contents increased during maturation. The amount of ether-extractive decreased, and the quantities of lipides (alcohol-chloroform-extractives minus ether-extractives), phosphorus, and nitrogen increased. pH values decreased gradually from pH 6.13 to 5.90 and then, turned back to neutral as maturation advanced.

8.0 NUTRITIONAL VALUES AND VITAMINS OF NORWEGIAN FISH AND FISH PRODUCTS

Taarland, Torleiv; Mathiesen, Erling; Ovsthus, Oydis; and Braekkan, Olav R.
Tidsskr. Hermetikind 44, 405-12 (1958)
Chemical Abstracts 53, 3528f (February 25, 1959)

Several Norwegian institutes have co-operated in preparing new tables of nutritional values and vitamin contents of all kinds of Norwegian foods. Tables on the vitamin contents and chemical composition of the most important fish and canned fish products are given.

8.42 COLORIMETRIC DETERMINATION OF LEAD IN MYTILUS EDULIS AND IN THE SEA WATER OF THE VIGO ESTUARY

Costa, Rafael Lopez and Molins, Rodriguez
Bol. inst. espan. oceanog. No. 84, 13 pp. (1957)
Chemical Abstracts 53, 7445d (April 25, 1959)

Mussels taken at various stations showed a greatly increased lead content in comparison with sea water. The average factor of enrichment was 38.5.

8.42 SALT AND WATER ANATOMY, CONSTANCY, AND REGULATION IN RELATED CRABS FROM MARINE AND TERRESTRIAL HABITATS

Flemister, Launce J. (Swarthmore Coll., Swarthmore, Pa.)
Biol. Bull. 115, 180-200 (1958)
Chemical Abstracts 53, 10577g (June 10, 1959)

Chloride, thiocyanate, inulin, and H_2O content of environment, blood, and urine were determined in order to clarify electrolyte and H_2O regulation in three crabs of different habitats: Gercarcinus lateralis (terrestrial), Ocypode albicans (semi-terrestrial), and Goniopsis cruentatus (marine). Persistence of normal Cl and H_2O values within a wide range of experimental environment salinities indicated effective regulation of electrolyte and H_2O volume and concentration.

8.42 COBALT CONTENT OF EAST PAKISTAN FISHES

Sharif, Mohammed Abu Hussain and Ahmed, Kamaluddin (Univ. Dacca)
Pakistan J. Sci. Ind. Research 1, 159-9 (1958)
Chemical Abstracts 53, 10578a (June 10, 1959)

8.50 BIOCHEMISTRY OF OCTOPUS

Asano, Motokazu (Tohoku Univ., Sendai)
Kagaku no Ryoki 11, 685-92 (1957)
Chemical Abstracts 52, 18930 (November 10, 1958)

Coloring matter, saliva, extractives, carotenoids, and vitamins of Octopus sp. are discussed.

8.50 STUDIES ON THE FAT METABOLISM OF FISH II. CONTENTS OF FAT AND CHOLIC ACID IN THE LIVER OF PACIFIC MACKEREL

Ono, Toyoki; Nagayama, Fumio; and Yamada, Tomo
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 10, 862-864 (1959)

The cholic acid level was higher in small livers than in large livers. Total content of cholic acid in the livers was in the range between 2.5 and 8.2 mg. and in most cases between 2.5 and 5.0 mg.

8.50 CHEMISTRY OF THE SUPPORTING TISSUE OF AQUATIC ANIMALS

Tsuchiya, Yasuhiko
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 10, 865-874 (1959) (English table and figures)

INDEX

Subject	Page No.	Card No.
Analysis, general		
Flame photometry for biological specimens	25	7.42
Analysis, inorganic		
Measuring sodium	25	7.42
Calcium in biological specimens	27	7.45
Total sulfur in biological materials	27	7.45
Analysis, organic		
Carbonyl compounds in oils	13	4.11
Electrophoresis of proteins	17	7.51
Components of fish odor	17	7.593
Analysis and composition, specifications and oil constants		
Maine sardine production	17	7.74
Byproducts, miscellaneous		
Swedish fish flour plant	17	6.54
Acid-digest meal	25	6.55
Herring waste for animals	25	6.55
Canned fish, processing		
Tuna in agar jelly	11	3.331
Browning of canned crab	23	3.3344
Chemistry and biochemistry, miscellaneous		
Fish proteins and lipids	1	0.32
Muscle cell size and extractives	1	0.36
Amylase in fishes	1	0.38
Crayfish myosin birefringence	21	0.321
Fish muscle proteins	21	0.321
Lingcod muscle nuclease	21	0.38
Lingcod muscle phosphoriboisomerase	21	0.38
Composition, inorganic		
Composition of maturing trout eggs	27	8.0
Food composition tables	27	8.0
Crabs from marine and terrestrial habitats	27	8.42
Cobalt content of fishes	27	8.42
Lead in Mytilus edulis	27	8.42
Composition, organic		
Industrial fish composition	19	8.0
Amino acids of lemon sole	19	8.51
Scleroproteins and polysaccharides of fish	27	8.50
Liver fat and cholic acid	27	8.50
Biochemistry of octopus	27	8.50
Amino acid composition of trout	29	8.51
Estradiol-17β from dogfish ova	29	8.51
Glutathione in mollusks	29	8.51
Polarographic studies of proteins	29	8.51
Cytochrome c from whale heart	29	8.59
Blood sugar in fish	29	8.59
Choline content of fish	29	8.59
Astaxanthin in salmon	29	8.59
Choline decomposition	29	8.59
Carotenoids of salmon	29	8.59
Dried and dehydrated fish		
Freeze-drying trash fish	11	3.60
Fundamentals of drying fish	11	3.60
Exploratory fishing		
Albacore fishing grounds	23	2.12
Shrimp exploration	23	2.12
Fish meal and oil, manufacture		
Toxicity of solvent extracted meal	15	6.139
Moisture in fish meal	25	6.14
Treatment for storage	25	6.14
Fishing methods		
Floating trawl tests	7	2.1471
Double rig shrimping	9	2.1471
Freshness of fish		
Assay for trimethylamine oxide	19	7.81
Odor components of fish	19	7.89
Frozen fish, changes in during freezing and cold storage		
Storage of kippers and mussels	9	3.2493
Protein denaturation	11	3.2495
Frozen fish, packaging		
Films for fish sausage	23	3.2382
Calcium alginate film for meat	23	3.2382
Handling fresh fish		
Enzymes for fish processing	7	2.3
Handling aboard vessel	9	2.15
Oils, chemical and physical properties		
Fatty acid structure	13	4.11
Autoxidation of methyl oleate	13	4.21
Odor of fish oils	13	4.21
Chemistry of fatty acids	15	4.29
Fractionation of lipids in SO_2	15	4.3
Oils, nutrition		
Dietary effect of fish oils	25	4.91
Effect of unsaturated fatty acids	25	4.91
Preserved fish, miscellaneous		
Storage of irradiated scallops	9	3.19
Preservatives and sanitation		
Fluorometric assay for CTC in ice	7	3.12
Toxicology	7	3.12
Chlortetracycline for salt fish	23	3.12
Spoilage		
Bacteriology of fish and brines	1	0.5
Spoilage of cod	3	2.01
Muscle physiology	3	2.02
Redox potential of fish sausage	21	2.01
Green discoloration in meat	21	2.01
Vitamins, vitamin A, chemistry		
Stability of commercial vitamin A	15	5.112
Vessels, fishing		
Cavitation damage	3	2.113
Plastics for hulls	3	2.115
Safe boat design	5	2.115
Plastic for hulls	5	2.115
Aluminum gillnetters	5	2.117
Fishing vessel development	5	2.117
Refrigerated croaker boat	21	2.114
Forces acting on rudder	21	2.114

8.51 POLAROGRAPHIC STUDIES ON THE MOLLUSCAN MEAT I.

Fukushima, Kiyoshi; Kikuchi, Takeaki; Osakabe, Isami; and Okada, Ikunosuke
Bulletin of the Japanese Society of Scientific Fisheries 23, No. 6, 331-334 (1957) (English abstract and figures)

In polarographic studies of glutathione involved in marine products, the authors found a new polarographic reduction wave. This polarographic reduction wave has a half-wave potential of nearly -1.25 V versus S.C.E. in McIlvaine's buffer solution of pH 7.0; and was observed only in the muscles of mollusca and crustacea and not in common fish flesh. The substance responsible for the reduction wave was found to be readily soluble in water, insoluble in ether, stable to heat (100° C.), and without volatility. The potential of this wave was affected by the pH value of the electrolytic solution.

8.51 POLAROGRAPHIC STUDIES OF PROTEINS CONTAINED IN FISH--PRELIMINARY REPORT

Kikuchi, Takeaki; Hirano, Toshiyuki; and Okada, Ikunosuke
Bulletin of the Japanese Society of Scientific Fisheries 23, Nos. 7 and 8, 467-470 (1957) (English abstract and figure)

The authors applied the polarographic protein wave to the studies of proteins contained in fish muscle, blood, and internal organs to learn about: (1) difference of polarographic protein wave between different species of aquatic animals; (2) difference of polarographic protein wave between common muscle and dark-colored muscle; (3) determination of the freshness; (4) denaturation of of protein during the γ-ray irradiation.

8.51 IDENTIFICATION OF ESTRADIOL-17β FROM DOGFISH (SQUALUS SUCKLEYI) OVA

Wotiz, Herbert H.; Botticelli, Charles; Hisaw, Frederick L., Jr. and Ringler, Ira (Boston Univ., Boston, Mass.)
J. Biol. Chem. 231, 589-92 (1958)
Chemical Abstracts 53, 591d (January 10, 1959)

Estradiol-17β was obtained from 836 grams of eggs removed from the ovaries of the dogfish and identified by counter-current distribution, paper chromatography, and comparative estrogenic action.

8.51 APPROXIMATE AMINO ACID COMPOSITION OF WILD AND HATCHERY TROUT (SALVELINUS FONTINALIS) AND SOME OF THEIR PRINCIPAL FOODS (GAMMARUS AND HEXAGINIA BILINEATA)

Block, Richard J.
Contribs. Boyce Thompson Inst. 20, 103-5 (1959)
Chemical Abstracts 53, 9495a (May 25, 1959)

The amino acid composition of wild and hatchery trout was similar.

8.59 PREPARATION OF CRYSTALLINE CYTOCHROME C FROM WHALE HEART MUSCLE

Minakami, Shigeki; Chitani, Koiti; Ishikura, Hisayuki; and Takahashi, Kenji (Tokyo Univ.)
J. Biochem. (Tokyo) 45, 547-9 (1958)
Chemical Abstracts 52, 18538 (November 10, 1958)

The crystalline preparation of cytochrome c exhibits paper electrophoretic, column (ion exchange) chromatographic patterns, Fe content, and C-terminal amino acid residue similar to those of beef and horse cytochrome c preparations.

8.59 ON THE BLOOD SUGAR OF FRESH WATER FISH

Fukuda, Hironari
Bulletin of the Japanese Society of Scientific Fisheries 23, No. 12, 782-784 (1958) (English abstract and table)

Blood sugar of pond-cultured fish or gentle stream fish are at a comparatively low concentration, ranging from 15 to 40 mg./dl., whereas that of the fish, living in the rushing stream, have high contents of blood sugar, ranging from 59 to 129 mg./dl. The highest value of blood sugar content is found in "yamame" trout, Oncorhynchus milktschitsch, which has 129 to 131 mg./dl., whereas the lowest value of 19 mg./dl. in the normal state is assigned to "unagi," Anguilla japonica, and "namazu," Parasilurus asotus.

8.59 STUDIES ON THE CHOLINE IN FISH--I. CONTENTS OF CHOLINE AND THE SIMILAR SUBSTANCES IN FISHES

Takada, Koji and Nishimoto, Jun-ichi
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 8, 632-635 (1958) (English abstract, tables, and figures)

The amount of choline and trimethylamine oxide (TMAO) increase generally in winter for demersal fishes and in summer for migrating fish. In cuttlefish and sharks, choline and TMAO contents were especially large, and their rates of change were remarkable. The choline content in fresh-water fish increased at first but decreased afterwards with the advance of putrefaction. TMA was formed even in the absence of TMAO. Choline formation in this study was found to be of a bacterial origin.
II. Decomposition of choline during the spoilage of fish meats. --Ibid. 636-639.

8.59 (Cross Reference: 8.6173)

STUDIES ON THE CAROTENOIDS OF SALMON I. IDENTIFICATION OF THE MUSCLE PIGMENTS

Kanemitsu, Tsunetoshi and Aoe, Hiroshi
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 3, 209-215 (1958) (English abstract, table, and figures)

Identification of the muscle carotenoid of the North Pacific salmon (Oncorhynchus nerka, O. kisutch, O. gorbuscha, O. tschawytscha, and O. keta) showed the presence of astaxanthin as the main fraction and small amounts of mono-cis isomer of astaxanthin. Astacene and β-carotene were not identified.
II. Determination of muscle pigment. --Ibid. Nos. 6 and 7, 555-558. Three methods were used to estimate astaxanthin in the dorsal, ventral, and caudal muscles of five species of North Pacific salmon.

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